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March 2000

# Electronics Australia

ea

New look issue next month!

## Sony's LCD projector
Big picture, small size, and small price!

## CES Show Report
All the latest gadgets from the US

## Build the Spin FX
An impressive light show, with minimal parts

## See in the dark!
Build a night vision scope

## NASA Maglifter
Shooting satellites into orbit

## I WANT MY MP3!
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PNR 313

Pioneer

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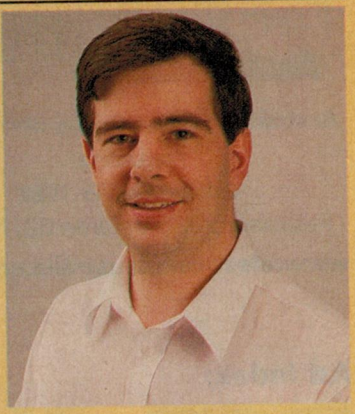
# Viewpoint



I'm worried. Very worried.

Back in the January issue, I made mention of the fact that you might have been reading my editorial somewhere around the turn of the century. If I had known the number of letters and emails I would receive on this statement alone, I would have dropped the subject there and then and talked about politics, or religion, or some other less controversial subject.

To set the record straight, yes, we all know that the Millennium doesn't *really* start until the 1st of January 2001. We know it, you know it, practically everybody in the world knows it. But 96% of the Earth's population celebrated the New Millennium on 1st January 2000.

Why? Because it was a fun thing to do.

## Come on guys, lighten up!

My worry is for the other 4% — that a lot of technically inclined people out there are so worried about the correct date for the turn of the century, that they seem to miss the whole point of the exercise. I ask all those who wrote in: what were you doing at midnight on the 31st? Sitting at home resolutely refusing to party because it wasn't really the beginning of the Millennium?

There is a certain social stigma attached to the Engineering profession, and it is this sort of pernickety attitude that perpetuates it. My advice? Lighten up guys! Drop the precise, technical manner and pull back to see if it *really* matters whether we celebrate the Millennium this year or next.

If we continue to put across this humourless straight-laced attitude, how can we hope to attract more people to engineering profession? If the rest of the world is going bananas over something, should we stand there and pontificate? No wonder we sit in the corner at parties...

Engineer jokes exist because we let the engineering methodology take over our lives, and we end up doing everything for the technically correct reason. This is a great idea in theory, but disastrous when it comes to relating to the outside world, or the people in it.

Engineering is clean, clear and precise, while the rest of the world is fuzzy, analogue and ambiguous — lets try to keep the two separate or we'll scare everybody off for good.

## EA is changing...

Yes, after 35 years on the newsstand as *Electronics Australia*, we are changing our name. As of next month, EA will be known as — EA. We'll have a new logo and with any luck, better paper and a square binding too. We've also been listening to your requests, and will be changing things like the contents page, which many have said is hard to read in its present form.

The result will be a more up to date magazine, with more appeal to more readers. However, I would like to stress that the change will only be in the presentation and layout of the magazine, and not in the content. We will still cover the latest in electronics, science and technology, and we will of course maintain our world famous construction projects.

So, be sure you find us next month — we'll be different on the outside, but the same on the inside. See you then!

***Graham Cattley***

Electronics Australia

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February 2000 Volume 62, No.3
**www.electronicsaustralia.com.au**

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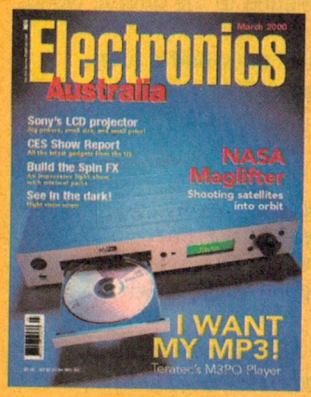


Terratec's new M3Po player is perhaps the first of its kind to appear on Australian market. It can play standard audio CDs, as well as MP3 files burned onto CD-ROM.
Add your own hard drive, and you can store around 200 CDs worth of music, with each track instantly accessible.
Check out our review on page 22
(Photo by Michael Pugh)


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Hey, lighten up!

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Mitsubishi's mini data projector; digital dictating from Sanyo; Sony brings home theatre into the digital age; long range digital cordless phone; new 2.1 Megapixel digicam from Olympus.

### CES Show Report 12

Welcome to the world's biggest line-up of gadgets, games and electronic aids, designed to make your life that much easier. Only the Americans could come up with The Annual Consumer Electronics Show, and we love them all the more for it.

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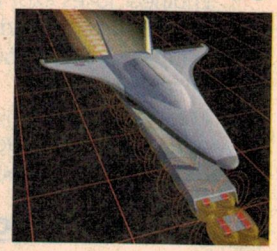

Is it alien technology, or are these researchers just playing at model trains? NASA's Maglifter is based on existing Maglev technology, but it looks as though it could be the biggest breakthrough in rocket technology we've seen so far.

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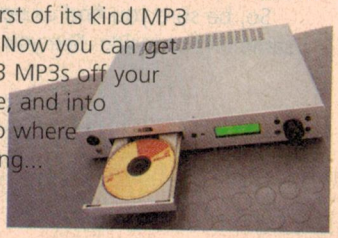
MP3 finally moves in to the living room, with Terratec's all new, never been seen before, first of its kind MP3 decoder. Now you can get those 723 MP3s off your hard drive, and into the stereo where they belong...



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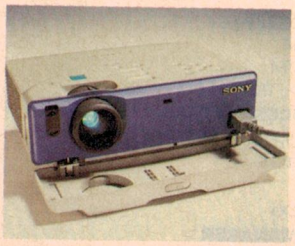


Sony's newest projector is small in size, but more importantly it's small in price too. Nice big picture though, as Jim Rowe found when he put the VPL-CS1 through its paces.

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Y2K Fizzer! "... Well, so much for the end of the world. A pattern was developing as the new millennium swept around the globe: No problems. Nothing. Nothing...."

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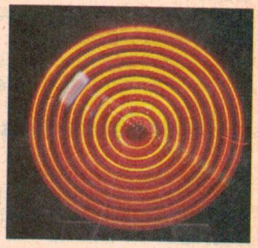

One chip, a sprinkling of components and a small motor combine together to provide the most spectacular light show we've seen. Build this cleverly designed project, and amaze everyone in town.

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Should you be entitled to info for servicing your gear? Some say not...

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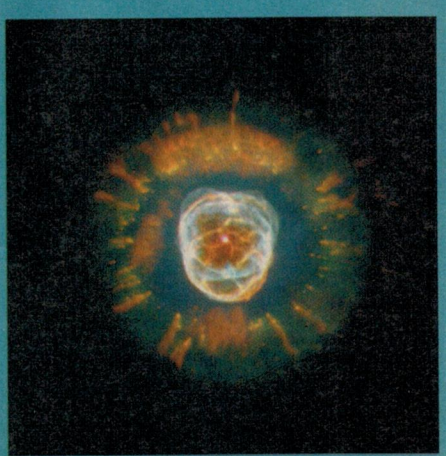

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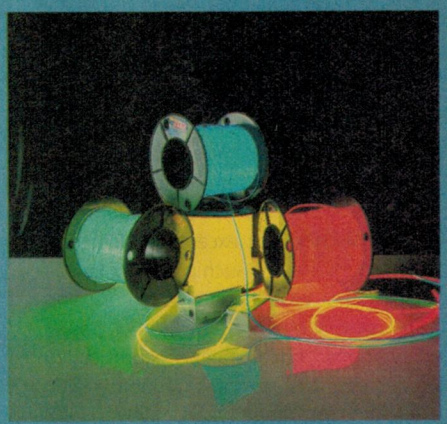

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# Letters to the Editor

## The Powerline Problem

I read Stewart Fist's article on electromagnetic radiation with interest (Open Fist, EA Jan 2000). Fist gives some background to some studies that show correlations between long term residence near power lines and a higher risk of getting cancer. Unlike many commentators, Fist correctly points out that correlation does NOT necessarily mean causation. However, Stewart Fist also states that "Epidemiology is ... totally ineffective when the causal factor is widely distributed and experienced equally by everyone. Statistics need exceptions" Quite right.

The trouble is, there are groups of people who are exceptions. Electrical workers are one such group. In fact all workers who have worked in ship engine rooms or smelters or power stations have been exposed to increased levels of low frequency EMR, often for many years. Why, I ask myself, is there not a large statistical blip among these workers if this exposure increases the risk of cancer? A related question might be: How does any increased risk compare, say, to the statistical risk of being killed in a motor car accident?

In the Oct 1999 Scientific American, a small article entitled 'Fat in the Fire' has another slant on this debate. Robert Liburdy, a biochemist working for the Lawrence Berkeley National Laboratory in the US was forced to retire because he flogged the data arising from his work on the effects of low intensity EM fields on cultured cells. Widely reported, this nice attempt at locating a physical effect from exposure to EMR is now unproved. In fact Liburdy reported only 7.1% of the recorded data points to support his theory. Not good science, but probably good for funding.

Just my two bob's worth.

*Alan McCallum (via email)*

## PAL DVDs

Further to my letter on the 4% speed problem with PAL DVDs (Forum, Dec 99).

I have just purchased the NTSC version of Madonna's '93:99' and the PAL Version of Cher's 'LIVE! in Concert' music video DVDs.

The Madonna DVD is derived from mostly filmed clips. The Cher DVD is a TV special produced by HBO in the U.S. Both the NTSC & PAL versions of these titles have THE SAME RUNNING TIMES!

In other words, there is no sped up transfer as with Movies resulting in an audio pitch shift and shorter viewing times between the NTSC and PAL versions.

If these DVDs can be with produced with identical times for both TV standards, I ask again why are movies still being speeded up 4% for the PAL market?

*Kevin Attwood (via email)*

## Analogue interests

I just got my Jan 2000 issue and read Edward Richards' letter and while I would not agree with the figures he quoted, I must say that 'Electronics Australia' is a bit behind despite being around a long time.

I have been reading your magazine since my school days and virtually grew up with Electronics Australia. I have learnt many things and enjoy the technical detail. Mr. Richards claims that every circuit is becoming very generic, this is true to a certain extent (take personal computers cars and cameras for example), they look similar, they all run on electrons, they can perform similar tasks but in different 'languages'. I have been a service technician for about 18 years and have seen the evolution of analogue into digital but have not been overwhelmed by it.

I have seen many younger people come in and think that everything is 'digital' so it must be the latest and the best. Unfortunately, they have missed the bit in the middle — the learning era.

Mr. Richards products may be focussed on narrow market segments but your magazine must appeal to a wider audience including the general public. Working for an Australian design company, I would say the figures are closer to 25% hardware and 75% software, and sometimes there are just pure analogue or clever switching arrangements that are made into products.

While it would be nice to see micro and PLD projects published in your magazine, they can understood if broken down into sections or blocks. By breaking down the PLD into it's logic functions, it workings can be understood rather than just seeing it as a magic box. Similarly with micro part, break it down into the individual sections, explain how the routines work and how it interacts with the hardware. This is what interests people and not just learning C. Remember everything used to be done in hardware before we had software. Let's start at the grass roots rather than the opposite end with high level programming languages.

*Salvatore Sidoti (via email)*

## More jobs at C

I read the 'C the future' Letter to the editor and find these comments quite true.

In 1994 I graduated from an Electronic/Communication degree at RMIT. My title being Computer System Engineer because I chose to do more digital and software than analog electronics etc. in my final year. During my course, the lecturers were all telling us the same thing — software accounts for 95% and hardware only 5% and most of us would end up writing software. So learn how to write software.

Currently I would consider myself an embedded software developer, as I develop embedded projects where I do all the software and some of the prototyping of the hardware. Most hardware work I do is debugging so that it works correctly and that the software works correctly with it.

The comment about the work becoming mundane after a few years is true. I'm coming up to five years and some tasks that were interesting and a challenge at the start, are now just a pain.

I don't agree that software engineers get paid more than an electronic engineer doing the same task. Remember, sometimes programmers (computer scientists) get called software engineers but this is wrong because they do not have the electronics background as engineers. So these salaries may be inflated by this but remember they AREN'T engineers and in some cases could not do an engineering job.

So all budding engineers out there should make sure they can write software, there are far more jobs in this area and was the other reason we were told to learn software while at uni.

These have been my experiences as a recent graduate and hope they may be of use to others.

*David Pleydell (via email)*

## Healthy criticism

It is not often I put pen to paper or finger to keyboard but I think a couple of items during the latter half of 1999 deserve some criticism. Firstly your magazine has been great reading generally over many years. Indeed it was your publications in 1958, which prompted me to put in some study and convert

from bus driver and enter this field.

Firstly, Information Center July 1999, regarding strange FM audio. Nothing strange about it. A phase reversal in one stereo leg, although probably not in the transmitter. More than likely in a repair or alteration in the program input equipment prior to the transmitter. Maybe the lines from studio to transmitter site. This happens sometimes during installation but is normally picked up during testing and set to work phase.

There should be no equipment (distribution amps, processors etc) in use that introduce a phase reversal anywhere in the station. I think 'small local' and 'test music', says most of it. I know some community FM stations rely heavily on voluntary work and notwithstanding all good intentions, errors of this nature would be easier made under these circumstances than a commercial or TV operation.

'D' type connectors. Correspondents and EA staff for that matter continue to refer to this series of connector as 'DB' whatever size. Since the advent of high-density D connectors (quite a number of years now) another convention has appeared. This is 'DA', 'DB', 'DC', 'DD' and 'DE'. The letters A, B, C, D and E indicating the connector shell size. E = 9 pin, A = 15 pin, B = 25 pin, C = 37 pin and D = 50 pin.

To the ongoing discussion on how much test equipment is really required to service domestic or consumer equipment. Maybe I shouldn't comment, never having worked in the probably highly competitive domestic field. But can you have too much? Things may be OK while faults are of a parrot or repetitive nature and the serviceman is very familiar with the make and model. I would certainly object to paying top hourly rate while a 'serviceman' blunders around a complex piece of kit looking for an obscure fault with a Variac and multimeter.

*R Rayner (via email)* ❖

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All contributions to EA will be considered for publication in this column

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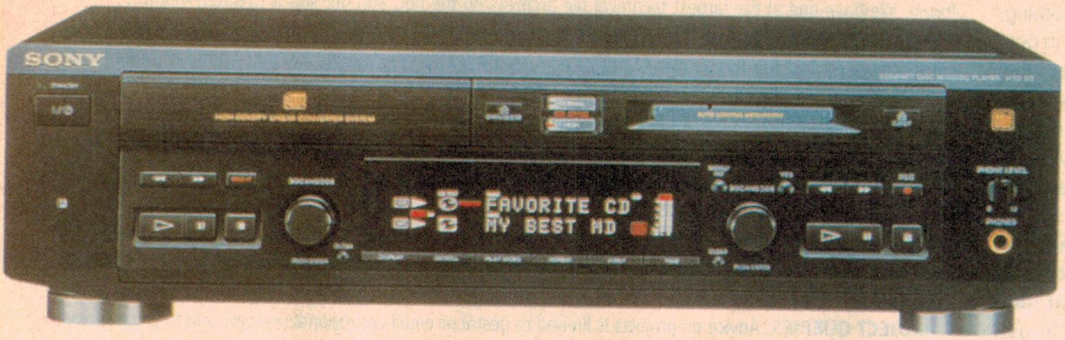
# WHAT'S new

in the ever-changing world of electronics




## Sony brings home theatre into the digital age

Sony Australia has just released their current range of hifi components, which offer further technological advancement in the reproduction of cinematic sound in the home theatre audio arena.

The latest range of hifi components offers 17 new models from DVD players through to Active speakers and a completely new range of receivers, priced from $469 through to $1299.

"Sony has again demonstrated its commitment to the area of home cinema with this latest range of hi-fi components," said David Allen, Product Manager Hi Fi, Sony Australia. "We are able to offer the consumer advanced audio technology and a virtual cinematic experience, from base models through to high-end sound product. As digital television moves closer, to get the most out of your home theatre, you will need components that have been engineered for digital sound."

Pictured here is Sony's new MiniDisc/CD combo deck, the MXD-D3 selling for $999. For more information on the MDX-D3, or on any of Sony's new lineup of digital home theatre equipment, contact the Sony Consumer Information Centre on (02) 9878 9712.

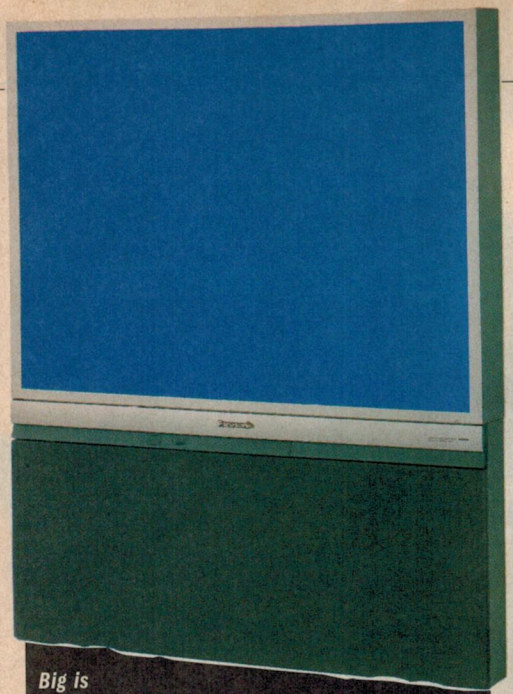
## Digital dictating from Sanyo

Sanyo have just announced the release of the their new digital voice recorder, the ICR -B100. This unique, hand held Digital Dictating Machine uses a standard Windows WAV voice file format, which means that now you can e-mail voice messages directly to the recipient. They can then either transcribe the message using the supplied transcription software (PC Memo Scriber) or alternatively the PC can convert the voice message to text, utilising Sanyo's link with IBM ViaVoice.

Background noise has always been one of the big issues with voice to text software but the ICR-B100 employs background noise suppression technology which substantially overcomes this problem. Another unique feature is the ability to not only download voice files to a PC, but to also upload voice messages to the ICR-B100. This means that voice messages may be emailed on a two way basis, allowing the recipient of any emailed voice message to play it back in voice format from the ICR-B100 without the necessity of a PC or Laptop.

Recording times of up to 128 minutes per smart media card are possible with unlimited recording time using the optional PC card. The unit comes complete with windows based software, all necessary transcription software, USB cable and interface and is available for under $1000 from Sanyo Office Machines, phone (02) 9417 7666.

***Designed for business and education, Pioneer's pint-sized DVD-V7200 offers a Video Blackboard feature, RS232 interface, PC mouse and keyboard inputs, plus a wireless remote control option.***



***Big is beautiful: At an RRP of $7,999, Panasonic's TX-51P100H 130cm rear projection TV has a 100Hz scan rate, multi picture-in-picture facility and a two-way 26W sound system.***

## Bose Wave Radio now has CD player

Bose has incorporated a compact disc player in its innovative Wave Radio. The fully featured CD player only increases the height on the unit by less than a centimetre, while maintaining the radio's impressive 'superior sound'.

The unit's 'waveguide' — a 68 centimetre acoustic tube that twists inside the case (which earned Dr Bose the Inventor of the Year Award in 1987) — had to be re-engineered in order to fit the new component. With the CD player in such close proximity to surfaces that radiated so much bass energy, detailed computer analysis on mechanical, acoustical and thermal properties were undertaken to refine the product.

The Wave Radio features a digital clock radio that has a dual alarm which can be set for two individual times, six AM and six FM radio presets, has mute scan and automatic sleep features. It also features a credit card-sized remote control.

The Wave Radio retails for $989 and is available in pearl or graphite grey. For further information about Bose stockists call 1800 023 367.

## New 2.1 Megapixel digicam from Olympus

In mid-1999, Olympus set the pace in the digital camera market with the introduction of the Camedia C-2000 Zoom. Featuring a large-diameter 3X zoom lens with a bright f/2.0 aperture, this high-end model brought photo-quality imaging to a digital camera with more than 2 megapixels. Earning high marks for performance and design, it defined a new market segment and quickly became a best-seller in the 2 megapixel class.

The company says its new camedia C-2020 Zoom marks the next stage in this evolution. It's claimed as the definitive model with more than 2 megapixels and the new leader of the personal digital camera market, combining the advantages of the earlier C-2000 Zoom with higher performance, easier handling and the creative expression of a broad range of functions.

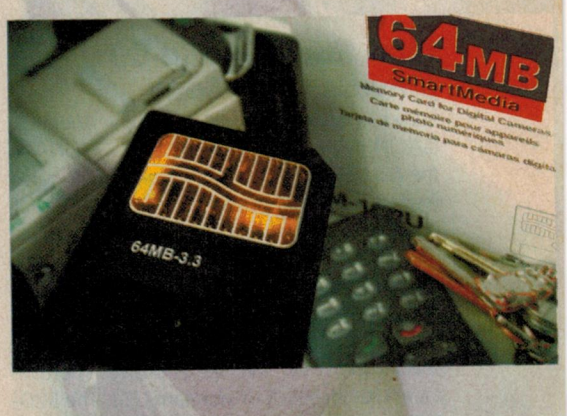
The C-2020 Zoom's outstanding resolution and image quality start with its 1/2" CCD with 2.1 million pixels and a high-performance Multivariator 3X zoom lens with a bright f/2.0 aperture. Reflecting Olympus' long-standing expertise in producing 35mm cameras, the new model also incorporates many photographic technologies including Aperture-Priority and Shutter-Priority Modes, Slow Synchro and more equivalent ISO sensitivity settings.

Creative control is enhanced by an array of new features:

- World's first digital camera that has a colour TFT monitor with a wide viewing angle so an image can be checked from the side;
- Manual exposure mode;
- Manual focusing;
- First Camedia model featuring simplified motion image recording compatible with the QuickTime Motion JPEG format;
- Auto bracketing;
- Sepia, Black & White and Whiteboard/Blackboard Modes.

With its all-around refinements to the earlier C-2000 Zoom, this latest Camedia model offers dramatic advances in image quality, performance and handling. The adjustment settings are more precise, while the layout and controls have been fine-tuned for simpler operation. It also has a compact and lightweight design that makes the camera more portable, and a new titanium-colour metallic finish giving it a classier look.

Approximate retail price for the C-2020 Zoom is $2049. For more information contact R Gunz (Photographic), Locked Bag 690, Beaconsfield 2014.



# WHAT'S new

## 900MHz digital cordless has long range

Dick Smith Electronics has launched a long-range cordless phone that provides superior call quality and security. The new DSE 900MHz Cordless Phone is claimed as the latest innovation in telephone technology, with a range of up to one kilometre — much greater than conventional cordless phones.

Digital encryption assures greater privacy and has over 16 million auto security code combinations. This provides security because digital transmission conversations cannot be overheard.

Other features of the phone include one way paging, adjustable handset volume, low battery indicator, 20 memory presets, audible 'Out of Range' warning as well as having a handy belt clip for the handset.

The DSE 900MHz Cordless Phone is available for $184 RRP from Dick Smith Electronics stores Australia wide and Dick Smith Electronics Powerhouse stores at Penrith, Bankstown, Moore Park in NSW and Carnegie and Nunawading in Victoria. It's also available via mail order by calling Dick Smith Electronics Direct Link on 1300 366 644 or visiting their website at **www.dse.com.au**.

## First Super Audio CD players from Sony

Sony has released the first two Super Audio CD (SACD) players — SCD-1 and SCD-777ES — in the Australian market. Both two-channel stereo models have been designed to unlock the full potential of the new SACD audio format.

The SCD-1 is Sony's reference player model, representing absolute top quality construction and sound reproduction capability. It makes the most of Super Audio CD's high quality specifications as well as exclusive improvements for playback of standard CDs. The SCD-777ES player is part of the company's top ranking Extremely High Standard (ES) range, which usually represents Sony's top range of audio component products.

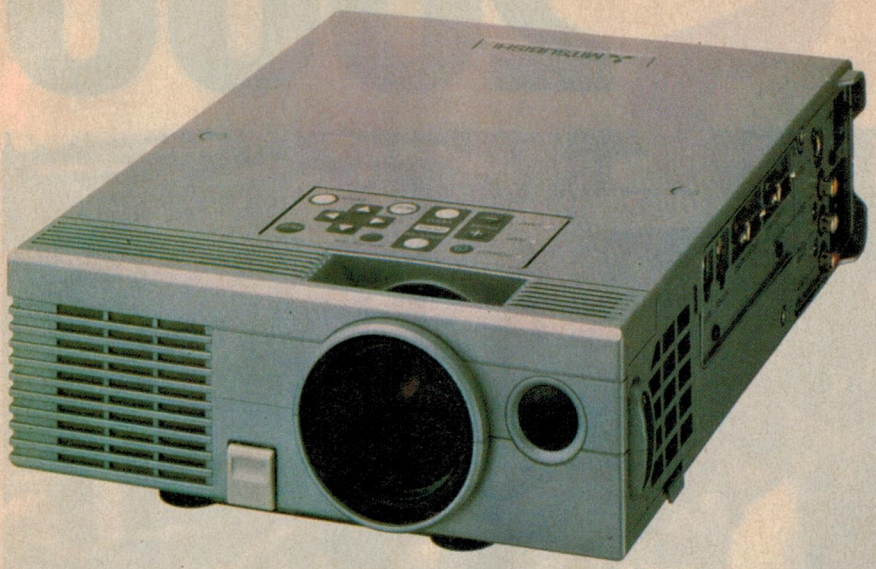
Super Audio CD software is recorded in Direct Stream Digital (DSD), a technology that employs a 1-bit digital signal to provide an extremely accurate reproduction of the analog waveform generated by the original source music. The SCD-1 has been designed to achieve the full, precise playback of the DSD signal. The player is also claimed to offer unsurpassed performance in the playback of ordinary CDs.

The SCD-1 uses an optical unit that employs twin optical pickups — one optimised for reading out high-density Super Audio CD content and the other for CD content — as part of a fixed optical mechanism. The player's simple 'base and pillar' construction employs a base chassis and supporting pillars enclosed by top and side panels to provide high stability and suppress and external vibration or internal resonance.

The SCD-777ES brings the Super Audio CD format to a wider audience of enthusiastic audio purists, designed in the distinctive ES-style which has already earned the reputation to satisfy the highest demands for hifi performance. This two-channel stereo compatible Super Audio CD Player borrows many of the high-quality features and specifications from the reference model SCD-1.

Both players feature technologies like the Synchronous Time Accuracy Controller (S-TACT) Pulse Generator, General Impedance Circuit (GIC) Low-Pass filter and Digital Filter VC24, contributing to the playback of clear, high quality sound.

The SCD-1 reference player has an RRP of $9999 and the SCD-777ES an RRP of $5999. For more information contact the Sony Consumer Information Centre on (02) 9878 9712 or visit **www.sel.sony.com/SEL/consumer/sacd**.



## Mitsubishi's mini data projector

The new LVP-X70U projector, weighing a tiny 3.2kg and offering brightness of 1100 ANSI lumens, is a new ultra portable projector designed for people on the go. Whether travelling interstate or globally, the extra compact projector is a sturdy travel companion that fits snugly inside its soft lined carry case.

The projector features a handy moving image PIP (Picture in Picture), which allows two moving images from two different sources (such as video and PC) to be displayed on the screen simultaneously.

The 'Cineview' built-in line doubler, means that high quality images with clear definition are guaranteed. It memorises previous and next-image fields and then processes the signals with extra motion detection to smooth out horizontal and vertical lines for finer, sharper moving images.

For clarity of colours and superior reproduction, the projector features 'Natural Colour Matrix', a special algorithm IC developed by Mitsubishi that allows the projection of RGB (red green blue) and YMC (yellow magenta cyan) colour spectra that are equal to those of CRTs. To bring out the best in pastels and skin tones, all six colours can be manually adjusted.

The LVP-X70U is the first of a new range of ultra portable multimedea LCD projectors from Mitsubishi, and has an RRP of $8900 (ex tax)

For more information contact Mitsubishi on (02) 9684 7777 or visit their website at: **www.mitsubishi-electric.com.au**.

## Komputer keyboard for Kids

The LittleFingers keyboard is claimed as the first keyboard specifically designed for small hands. With it, children can quickly learn one of the most important and lasting computer skills: typing. The size and spacing of the keys have been scientifically engineered to allow younger children to easily reach all of the keys, naturally and comfortably, and to optimise their typing performance. Students can now learn to touch-type proficiently without having to hunt-and-peck on an adult sized keyboard.

Another feature is the inclusion of lower case letters on the keycaps — helping to address another area where younger users have to grapple with technology designed for adults. Coupled with this comes an integrated trackball with lockable scroll buttons, greatly simplifying use for younger users and eliminating 'lost mice' problems.

While focused on the educational market, LittleFingers is expected to find a place in homes where parents wish to ensure that their children can gain effective user of a PC from an early age. It was only released onto the US market mid last year and has already found an important niche. Its concept is so original that it was awarded an exclusive United States utility patent and foreign patents are pending.

For more information contact distributor DBZ Publishing, 23 Katawa Grove, Brunswick, Vic 3056.

## Analog camcorder has 3.8" LCD screen

Panasonic has released its latest analog VHS-C camcorder — the NV-VX87 — with a large 3.8" (9.6cm) LCD screen that offers high-quality viewing and makes it easy to capture great images.

The new video camera is priced at $1899 (RRP). It incorporates all the popular features from the company's VHS-C range, including digital zoom, 14 digital picture effects and black and white recording at night. It also uses lithium-ion batteries, which make it possible to top up the charge without the 'memory effect'.

The 0-Lux Night View Function plus Motion Sensor makes video recording possible in places without any illumination, resulting in high-quality black and white pictures. This is ideal for studying subjects such as nocturnal animals, which would not permit recording using a video light.

A Super Image Stabiliser uses a large-capacity 450,000-pixel CCD to deliver 300-line horizontal resolution, keeping the picture stable even when shooting from a moving vehicle or recording distant subjects in the tele setting. The colour monitor has a non-glare silica-coated LCD screen that is resistant to fingerprints and dirt and wipes clean easily. The monitor rotates through 270° and offers a very wide angle of view: 120° horizontally and 100° vertically.

The NV-VX87 is available from leading electrical retailers. For more information contact Panasonic Customer Care on 132 600. ❖

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# CES 2000

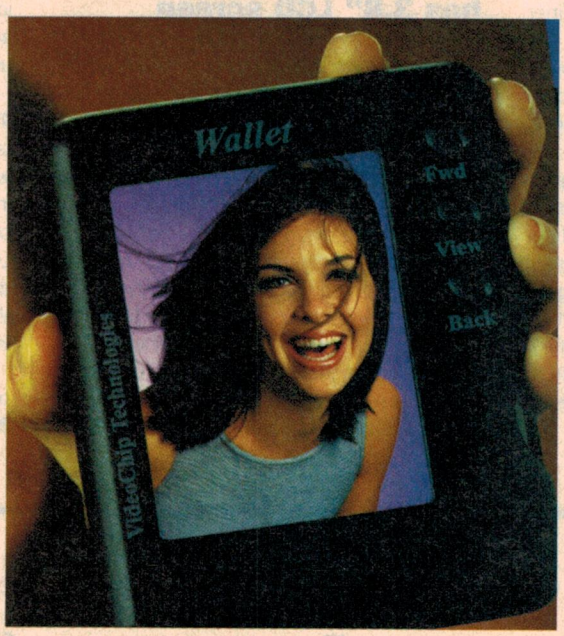
**If you like gadgets, then the Consumer Electronics Show held in Las Vegas every year is gadget heaven. It offers a wealth of new products each year that appeal to consumers who buy on impulse anything from the silly to the cute. Here's a selection of some of this year's gadgets...**

## by Paul Swart

### Stone the Ions...

Those who are concerned about all those positive ions floating around computers, microwave ovens, cellular phones and TVs will want to rush to their local electronics store to purchase the X-Ion from Elektro-K of Los Angeles, (**www.x-ion.org**). X-ion is a small black tablet made of a material called tourmaline that you stick to the front or side of an electronic device. Tourmaline is a natural, semi-precious stone that supposedly has the ability to absorb moisture from the air and convert that into negative ions. As these negative ions are released, they interact with bad positive ions emanating from an electronic device, and the two cancel each other out. A four-pack of X-ion tablet retails for around $15.

Whether it really works and whether the health issues are real or imagined remains to be seen. But other than the $15, a consumer doesn't stand to lose an awful lot.




*Also new in the video market is the 'video wallet'. VideoChip Technologies of Woodbury, New Jersey, launched the $400 'Wallet', a 120 x 95 x 20mm LCD photo album that can store up to 200 images.*

### PC on your HDTV

Perhaps the ultimate in computer and television integration was a new HDTV decoder PC card under development at Creative labs. The board, which incorporates an HDTV decoder processor chip, takes digital television signals, including 720l and 1080l HDTV programming right off a rooftop antenna and displays the HDTV image inside a window on the digital or HDTV television set, which also becomes the PC's display. With most HDTV featuring a wide screen display format, there is room enough to run a large TV image along side a Web browser window, and one or more open software applications. The board will be available in the summer and sell for around $400.

### Phone products

A growing number of products integrate the telephone and the Internet. Infogear (**www.infogear.com**) won

the prestigious 'Best of the Show' award with its iPhone that lets users make regular phone calls, surf the Internet or send and receive email messages using a touch-sensitive display and keyboard. The $400 device will become available in retail stores across the United States this spring.

Cordless phones were one of the hot new consumer items at CES 15 years ago. Now, a new generation of cordless headset phones is entering the market that will free both hands to let you continue with your everyday activities for up to 150 feet away from the base station. Plantronics (**www.plantronics.com**) of Santa Cruz, California launched the CT10 Cordless Headset Telephone, a 900MHz portable phone using a remote set that is worn on a belt or clipped to a piece of clothing.

Tired of playing the role of telephone receptionist for your son or daughter? Cygnion (**www.Cygnion.com**), an LM Ericsson spin off launched the CyberGenie, a cordless, PC-driven home telephone and voicemail system. Using CyberGenie's PC software, the system can be programmed ask the caller who they want to speak with and subsequently direct the call to any of 4 different cordless phones. If that person doesn't answer, a voice mail facility is activated. CyberGenie will retail for around $400 for the base station, software and one cordless phone, plus $150 for each additional handset.

CyberGenie will let users retrieve their particular messages, faxes and e-mails from anywhere. Because it recognizes the user's voice, calling someone is as simple as speaking that person's name.

*Record-A-Phone of New York launched a product the late President Nixon would surely have wanted in his Oval Office; a telephone handset with built-in cassette recorder. Recording a call is as easy as pushing the 'Record' button on the side of the $50 unit.*

*Plantronics (**www.plantronics.com**) of Santa Cruz, California launched the CT10 Cordless Headset Telephone, a 900MHz portable phone using a remote set that is worn on a belt or clipped to a piece of clothing.*

*Video phones refuse to go away even five years after the gadgets became affordable enough. This year, Fortuna Electronics seemed to have the most functional device which combines a telephone, videophone and small television. Images are fairly smooth and picture clarity is acceptable.*

## 5-channels, two ears

Dolby's first and much anticipated headphone system is being licensed by the company to manufacturers who want to make and sell the sophisticated sets, which are built around an advanced a digital signal processor. The Dolby Headphones comprises an advanced sound processing system that simulates the sound signature of a typical 5-speaker playback system.

The DSP electronically imparts to each audio channel — two on stereo programs and up to five on surround programs — the sonic signature of each of five speakers carefully positioned in a precisely defined virtual

*Anyone who works 4-8 hours or so behind a computer each day will appreciate the Eclipse Computer Light from One Tech. The device sits atop the computer monitor, and a 'soft light' is beamed upward to a reflecting disk that produces a mild glow around the computer workspace area without producing any glare on the computer monitor.*

*DVD recorders are slowly becoming a reality as at least three major companies, Philips, Sharp and Panasonic showed off their initial DVD-RW recorders. But at prices of $2,000 to $4,000, this year's models are not likely to be a widely available item. Industry analysts don't expect this market to develop into a market factor until 2003.*

acoustic environment. The effect is that the single headphone creates the illusion of a five-speaker system, thus creating a near perfect headphone audio experience. The first Dolby headphones are expected to be launched later this year.

## Twin PCs

Personal computers, even those with processing speeds in excess of 600MHz can be purchased for around $1,300. But thanks to Applica of South San Francisco, computer buyers can now get two such 600MHz PCs for the price of one. During normal operation, most of the computer's microprocessor power is unused. Applica's PC networking hub effectively splits a PC into two identical computers by using the unused processing capacity to create a second virtual system. In addition, it also lets the user watch high-quality DVD video on a connected television set, which functions as a third monitor.

The only thing the second user needs is a keyboard, mouse and monitor that hook up to the $200 Applica networking box that is about the size of a VHS cassette.

## 3D TV not here yet

Four years ago Sanyo came to Las Vegas showing off a line of prototype 3D televisions. Watching the images for more than a minute was such a headache-provoking experience that the sets never made it to the market.

This year Sanyo tried again with new 3D displays that don't require any special glasses, but the technology appears headed to the same

## MP3 rules in audio

Most new products launched at the Consumer Electronics Show each year offer innovative applications of various technologies, a number have the potential to have a major impact on our lifestyles.

In the past, CES has seen the introduction of the VCR, audio CD, satellite television and DVD. This year a number of products combined advanced technology and innovation to create completely new products that, when accepted by the consumer, are likely to have profound impact on the lifestyles of millions of people.

Creative Labs, for example, demonstrated the NOMAD, a 6-gigabyte portable audio player that has enough capacity to record 150 full-length audio CD records, or up to 2600 hours of spoken word. The NOMAD will be available this spring for under $400 and will let consumers put a huge collection of all their favourite songs from various audio CD onto a single storage disk.

The device weights just 14 ounces and carries like any regular portable CD player. It interfaces with a personal computer to download music content from the Internet or from audio CDs when connected to a home entertainment system. Users can either play back the content through a headset, or over their home entertainment receiver and effectively play back a seemingly endless series of their favourite songs. The PC software interface lets the user sort the hundreds of song titles in any number of folders, such as by title or category ("Country," "Rock,' Classic," etc.). Users have the option of playing back all the songs from a particular category or artist, or play all of the recorded titles in random order.

One of the most talked-about MP3 devices was the I-Go from i2Go (**www.i2go.com**) that lets consumers download music, spoken content, audio books, or even email messages and play the content back over their car's audio system. The iGo, about the size of a pack of cigarettes, has 640 megabytes of memory. It converts downloaded standard e-mail messages to MP3 format files and then converts the text to synthe-

sised voice, which can be played back while driving in to work. Then, the iGo lets you verbally record a response, which the user can convert to text and insert into a reply email.

The iGo can be worn on a belt, but also has an attachment that lets you stick to a car windshield.

Unitec of Korea (**www.unitec.co.kr**) launched a 'Rome' MP3 player that is designed in the familiar shape of a regular cassette tape. The unit ($169 retail in the U.S.) can be used as a stand-alone like every other MP3 player device, or it can be inserted into any car or home stereo cassette player so the user can listen to music downloaded from the Internet while driving or in a hifi home entertainment system.

## Sony sticks to MP3

MP3 digital players and recording devices were available from dozens of vendors in all kinds of different shapes. It is clearly the next big thing in portable audio. The most sophisticated is Sony's Memory Stick technology that lets consumers download or create digital content, including music, photos, documents, and video then store it on memory sticks that are inserted into a device, such as a camera, PC, MP3 player, photo printer or fax machine.

Sony's CES booth was a small exhibit hall in itself at the Las Vegas Convention Centre. Groups of 100 or so visitors were let into a theatre for a review of the company's latest audio and video products before they were turned loose in the exhibit area where dozens of new products for the home and automobile were demonstrated.

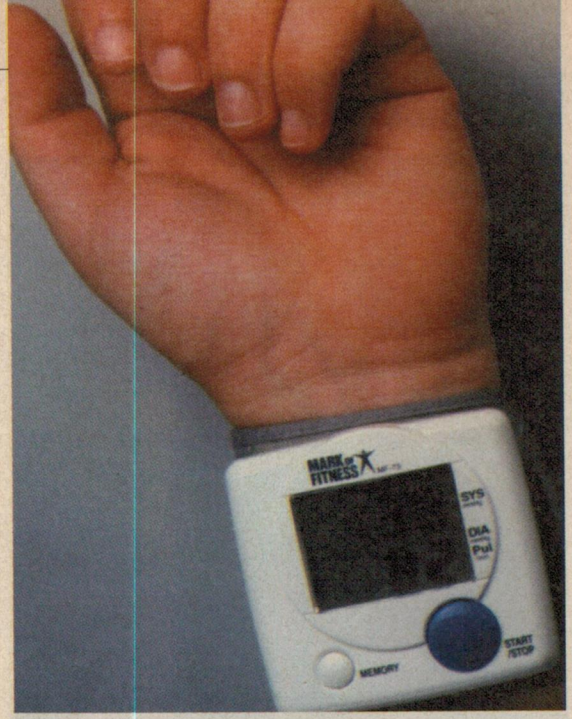
A Sony video demonstrated the company's vision of a world in which the memory sticks are the foundation of new ways for people to work, be creative and entertain themselves.

technological scrap pile. While the still images provided a spectacular 3D effect on the 17-inch flat-panel displays, it requires the viewer to hold their head perfectly still or become instantly disoriented as the 3D image shifts out of focus at the slightest head reposition. Sanyo thinks it can find some niche markets such as medicine to popularize the technology.

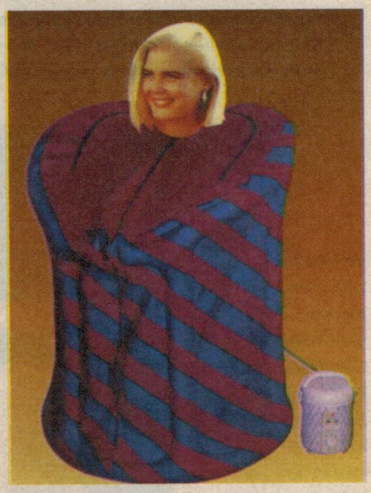
My feeling is that in its current state, it won't be worth the trouble to market the displays. It will be nearly impossible to solve the disorientation problem, due to the very nature of a 3D design. And as long as that is not addressed, there is no market for a product that causes more problems than it solves.

## Touchy-feely remote

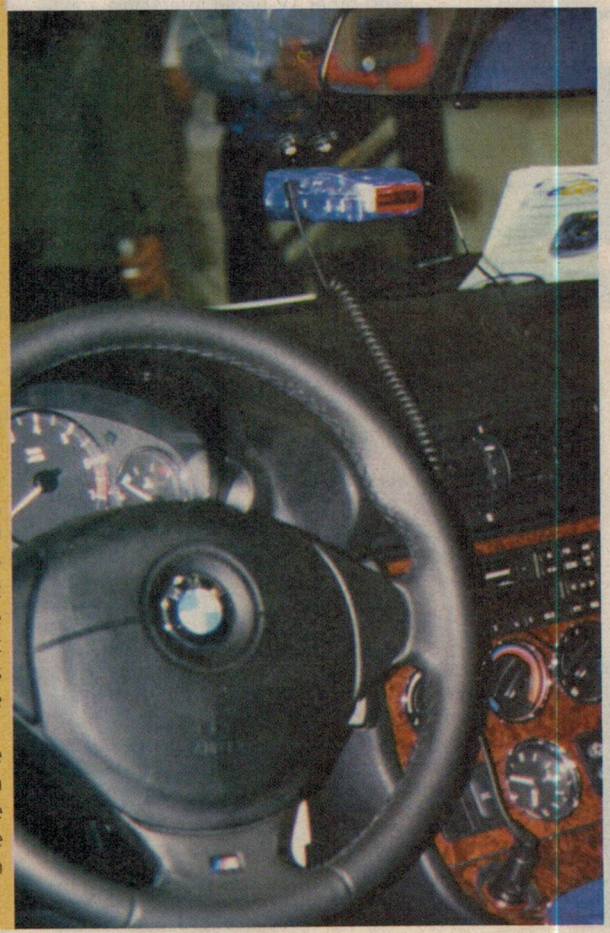
The last thing your coffee table needs is another remote control. Already, the TV, Stereo, VCR and DVD remotes are making coffee tables look like high-tech bazaars. Then there are more remotes for cable and satellite TV receivers. And still more devices are heading for




*The Wristwatch Blood Pressure Monitor from Mark of Fitness is a $99 device that takes your pulse and blood pressure, and keeps a record for the last seven tests so users can easily keep records and track their heart beat and blood pressure at different times during the day, week, or month.*



*For under $300, Seastarband of China offers a line of 'Family Steam Sauna Bath' products. The portable saunas consist of an insulated bag with a heavy-duty plastic interior lining. One or two-person models are available...*



*The ultimate in video technology for the automobile would have to be the motorized satellite TV tracking system from Accellvision that lets you watch satellite TV broadcasts no matter where your trips may take you. No matter how sharp you make a turn, the built-in compass will keep the satellite dish pointed at the radio or television satellite 22,000 miles up in space.*

*Shakehand Tec of Taiwan launched a new line of electrical shoe shine machines for the home. The system has a built-in radio, even though it takes but a few seconds to work up a spiffy shine on any pair of shoes held under the high-speed polishers.*

the coffee table as new gadgets become popular such as TiVo and RePlay digital video records, WebTV devices, HDTV sets, and other next-generation devices.

At CES, ZiLOG announced an alliance with Synaptics to use the latter's TouchPad as the input device for ZiLOG's AHI Navigator, a universal infrared remote that controls a broad range of entertainment devices. Consumers can access their television, video, email and the Internet all through the AHI Navigator and by using their fingertip to write commands onto the touch-sensitive TouchPad.

In addition to performing the standard remote control functions, the Synaptics TouchPad on AHI Navigator enables consumers to use 'virtual' buttons on the TouchPad that are activated by tapping in designated areas. AHI Navigator can also be used as a full motion cursor that simulates the PC mouse function.

"The TouchPad with AHI Navigator is the perfect alternative to keyboards for email, Web navigation, and other TV-based interactive applications," said Alice Leeper, director

*For the kitchen with everything there now is the 'Information Communications Entertainment Box' (iCEBOX) from CMi Worldwide , an 'infopliance' designed for the kitchen. The iCEBOX lets you watch TV while cooking, surf the Web, send and receive e-mail, shop online, play audio CDs and prepare weekly menus and household schedules. With an optional video camera, the device even lets parents keep an eye on their kids...*

## HDTV ready to go

There have been reports over the past few months that the High Definition TV market may be in trouble, as only a few hundred thousand HDTV sets have been sold in the US so far — not enough to entice broadcasters to invest in developing HDTV content. Today, only a few sporting events are broadcast in HDTV, along with the Jay Leno Late Night show along with a few others from CBS.

But CES 2000 made it abundantly clear that the HDTV movement is set to break out for mass market adoption with a broad range of new products, a greater variety of sets, ranging from 28-inch and 60-inch flat-panel systems to 65-inch projection and digital tube sets.

Demand, though still relatively small in volume numbers, is also picking up. Toshiba officials said fourth quarter sales had exceeded their production forecasts and most stores sold every system including their floor models.

All major television set manufacturers came to CES pushing almost exclusively their HDTV and DTV sets. While still pricey, the average cost appears headed for the $4000-$5000 level, down from $6500 -$8500 just a couple of months ago. Thomson, for example launched a new 38-inch widescreen HDTV set with built-in decoder that will retail for under $4000.

"We have determined that it is time to jump start the sale of HDTV sets. At below $4000, the entry point is now less than 50% of where it was just one year ago," said Thomson senior vice president Michael O'Hare. The 38-inch set will be sold in the United States under the RCA brand name. A 34-inch version will be available under the Proscan brand for $3,500.

In addition, a number of companies are pushing products that will let consumers enjoy HDTV-level programming on regular, inexpensive, analog sets, and even upgrade the picture quality of

their existing analog set to a level rivaling the state-of-the-art 1080I (interlaced). New technologies are also promising to both further enhance HDTV picture quality and bring cost down.

Zenith Electronics showed off the world's largest hang-on-the-wall plasma HDTV display — a 60-inch wide-screen model. The 60-inch PDP (plasma display panel) delivers high-resolution images on an ultra-thin 4 inch, lightweight display panel with a screen as big as four 30-inch TVs combined. The giant PDP will be sold in stores starting in 2001.

## Ferroelectric displays

By far the most revolutionary of new HDTV technology was shown in the Samsung booth, where a 60-inch 16:9 aspect ratio projection set featured the 'LightCaster' ferroelectric liquid crystal (FLC) display technology invented by DisplayTech of Longmont, Colorado.

The set is built around three LightCaster chips that feature a mirror-like three-quarter square inch liquid crystal surface. The surface is covered with pixels that are smaller than five microns in width and switch at speeds of 100 microseconds, 10 to 100 times faster than conventional LCDs. It allows ultra clear color images to be generated on the display.

In the case of the 60-inch Samsung display, three chips are used, one for each primary color, creating an image that is so crystal clear, even in a very brightly lighted area most visitors were startled at the image quality. The FLC-based sets will also be much less expensive to manufacture than other large-size HDTV sets.

## LCD Screens

Meanwhile, a number of companies showed off their new flat LCD-based HDTV displays; Sharp Electronics was the most popular company there, with their 28 inch LC-28HD1, the world's largest LCD HDTV display. The monitor features versatile video component inputs, PC compatibility and wide-screen high definition resolution. It is aimed at crystal-clear viewing of a wide range of digital video sources, from DVD to PCs to high-definition television signals.

*Give up? it's a portable DVD of course!. Minolta and several other companies showed portable DVD players, which let the viewer watch a movie in complete privacy. There's just one problem: What's the point of its being portable, if you can't see where you are going?*

The LC-28HD1 provides full 720 progressive scan (720P) high-definition native display resolution in a widescreen 16:9 aspect ratio and measures 2.3-inches in thickness. It will accept DTV input signals including 1080I (interlaced), 720P and 480P formats in both component (Y, PR, PB) and RGBHV.

The LC-28HD1 utilizes Sharp's Digital Gamma Correction Circuit, which dramatically improves the quality of the images viewed on the LCD screen. This ensures improved reproduction of detail in night scenes. Sharp's Digital Gamma Correction enhances picture clarity by lightening the background while maintaining the correct brightness of the subject. As a result, the viewability of an image is enhanced by maximising background detail, making the entire image easier to view...❖

of ZiLOG's IR Business Line. "Using the TouchPad is fun, like writing with your finger in the sand. The user simply writes commands or messages in block letters with a fingertip. The handwriting recognition software recognizes the characters immediately, so there is no time delay. And there is no stylus to misplace."

## Video on demand

TiVo, the creator of the digital video recorder, and Blockbuster, the world's largest home entertainment rental company, announced an alliance to expand Blockbuster's traditional video rental business to an entertainment service delivered through the TiVo digital video recorder. The companies will develop and deploy a video-on-demand service that will enable TiVo subscribers to obtain a selection of movies from Blockbuster for viewing through their TiVo receivers.

"Our goal at Blockbuster is to provide quality movies conveniently to people at home whether it's from our retail store base or through exciting new technologies like TiVo," said Santo Politi, Blockbuster president, new media group. "We are looking forward to working with TiVo to deploy this video on demand service and to giving TiVo customers more choice and more control to watch what they want, when they want it."

## Internet DVD

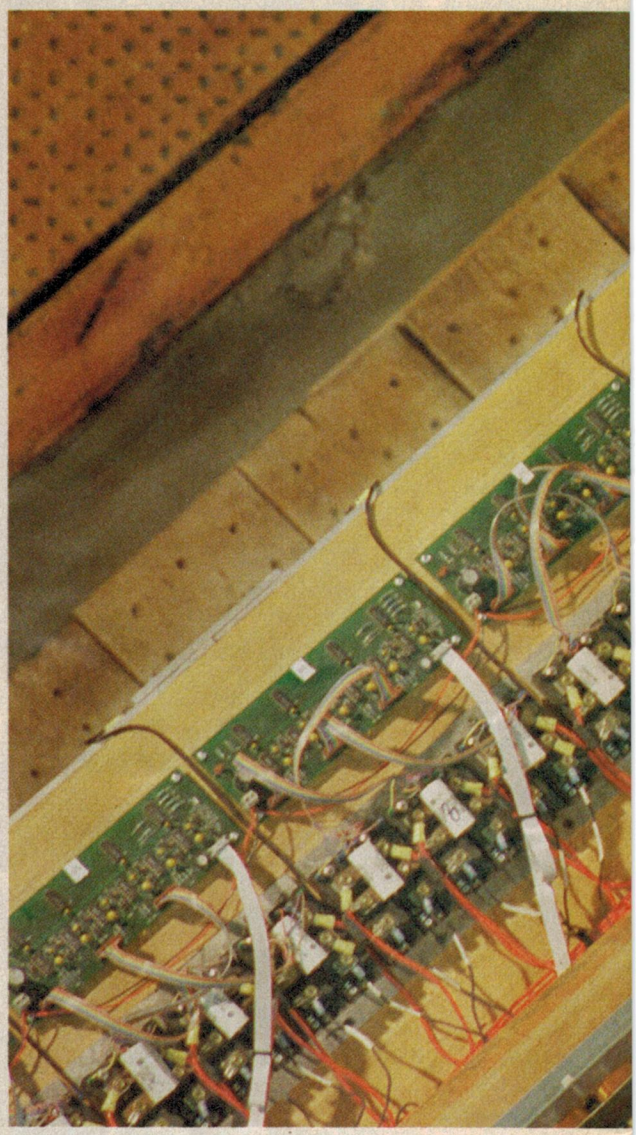
And with more and more rich content becoming available for download from the Internet, it was inevitable for Internet DVD players to become available. National Semiconductor and Planetweb announced the industry's first reference platform for an Internet DVD (iDVD) player. Based on Planetweb software and National's Mediamatics Pantera-DVD hardware, the new iDVD platform can deliver advanced DVD features, personalized entertainment content, Internet browsing, email and more. National and Planetweb already have several ISPs who plan to introduce subsidised iDVD players in early 2000. iDVD players could account for 25% of the overall DVD market in 2000, growing to as much as 50% by 2002, especially when features like time shifting and recording are integrated into the players.❖

# Maglifter

## NASA's space slingshot

**New Maglev technology offers a ridiculously cheap and effective way to get satellites, payloads and even passengers into orbit. The revolutionary propulsion drive developed by Sussex university could do away with conventional chemical thrusters, and usher in a whole new way to get man into space.**

**by Michael Fitzpatrick**



Seemingly taking its cue from a Thunderbird's script, NASA recently embarked on a sensational new scheme to float its rockets into space.

Chosen to head the project was Sussex University's Eric Laithwaite whom NASA simply told: "We'll give you a hollowed out 10,000ft mountain from where we want you to help us launch a probe into space using levitated locomotion."

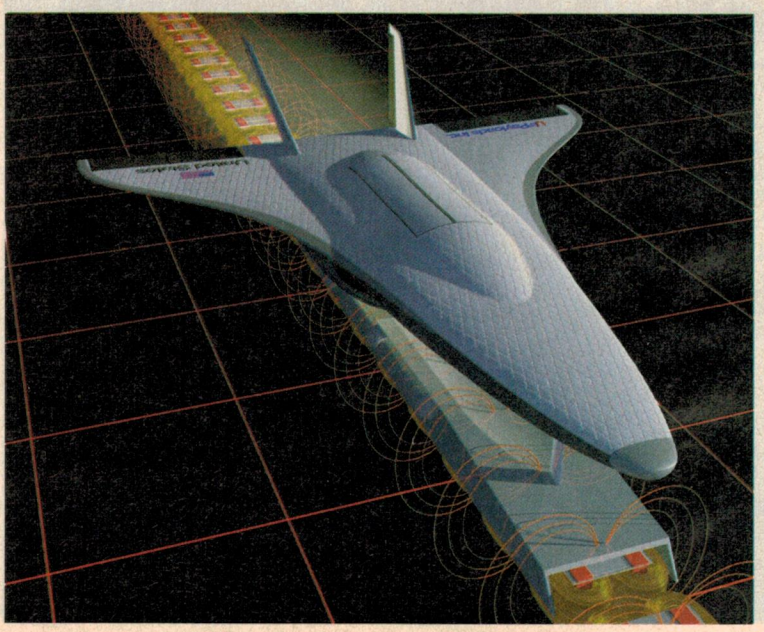
"I showed them all the magic of magnetic levitation," said Laithwaite happily, "and they gave me a contract." He was working on his beloved 'Maglifter' project when he collapsed and died.

NASA's dream of turning science fiction into fact might have died with him, as Laithwaite was the world's leading expert on magnetic levitation (maglev) technology. Fortunately, his colleagues at Sussex were quick to take up the baton. That same groundbreaking work now continues with NASA on a levitation-based launch system and in October last year the British team proudly revealed a working prototype to the astonishment of the world's press.

What has generated all the admiration is a track at NASA's Marshall Space Flight Centre in Alabama that accelerates a model spacecraft from zero to 60 in less than a half-second. More astonishing still is the fact that the principles behind the Maglifter are relatively simple and have been around for years.

Just as high-strength magnets lift and propel high-speed trains and roller coasters a couple of inches above a guideway, the maglev launch-assist system will electromagnetically drive a space vehicle down a track.

Because the rocket rests on air there is little friction to overcome and it is able to accelerate smoothly without wasting a lot of fuel. This is where the



*An artist's concept of a magnetic levitation system for space launch. (Photo courtesy NASA)*

Bond film special effects become reality says NASA. Placed on a sledge, the magnetically levitated vehicle would separate from its carrier, be catapulted from the ground at 600mph, and then shift to a rocket engine to reach orbit. NASA reckons this system will save billions of dollars in launch costs, as the Maglifter requires so little energy to propel the craft.

Sherry Buschmann, manager of the Marshall Centre's launch Technologies explains the benefits of what was, until now, a schoolboy fantasy. "The weight of propellant is a major culprit in the high cost of conventional rocket launches. But because maglev uses electricity — an off-board energy source — for launch assist, the weight of the vehicle at lift-off is about 20 percent less than a typical rocket, resulting in tremendous savings in the cost of getting to space. Each launch using a full-scale maglev track would consume only about $75 worth of electricity in today's market."

***Bill Jacobs, maglev lead engineer at Marshall, prepares the carrier for a speedy trip along the 44-foot-long test track. (Photo courtesy NASA)***

According to NASA, this technology could be used to help launch much larger payloads to orbit within the next 20 years for only hundreds of dollars per kilo — a welcome contrast to today's launch costs of $20,000 per kilo.

**'The thrust is revolutionary. We can use very high current densities unimaginable in other machines'**

## Familiar technology

The technology behind the experimental track at Marshall — advanced linear induction motors — is similar to that those found in fans, power drills and sewing machines where you will find linear induction motors' less glamorous relative, the induction motor. As the name suggests, linear induction motors produce thrust in a straight line instead of spinning in a circular motion to turn a shaft as induction motors do. (Linear induction motors are basically a rotary motor split in half and rolled out flat.)

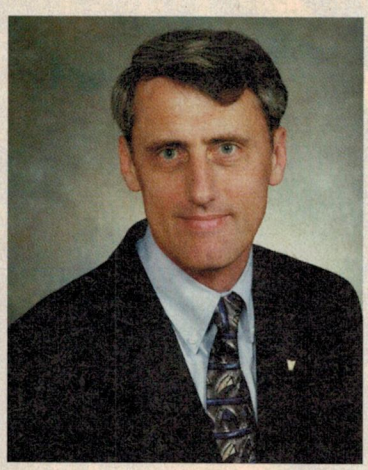
With Maglifter, when the coils of the linear induction motor are energised by alternating current, a magnetic field is created providing thrust that pushes an aluminium carrier along the maglev track. A horseshoe-shaped carrier containing a 1.5 metre, 50kg

*A model spacecraft atop a carrier is levitated and accelerated along the track during tests. (Photo courtesy NASA)*

spacecraft model is then levitated about one-half inch above the 15-metre track as it accelerates at six times the force of gravity.

The Maglifter team, now led by Prof. Bhalchandra Jayawant, also from Sussex University, successfully levitated then accelerated their rocket carrier and brought it to rest on the track at NASA's Marshal space flight centre in Alabama last September. The breakthrough he says came with the development of a maglev propulsion drive capable of generating much more thrust than achieved previously with the conventional linear motors that drive other maglev systems. 'The thrust is revolutionary. We can use very high current densities unimaginable in other machines,' explains engineer Bill Edwards who is working on the project with Jayawant.

Although the Maglifter runs along similar principles to the maglev train that recently operated at Birmingham airport, the major difference between ground transport systems and launching space craft is acceleration. Says Edwards: 'We are working for a design acceleration of 2G whereas with a train system you don't to go above 0.1G. With our system you get 20 times the acceleration and 20 times the force for a given weight.'



*Dr. John (Row) Rogacki, director of the Space Transportation Directorate at NASAOs Marshall Space Flight Center in Huntsville, Ala. (Photo courtesy NASA)*

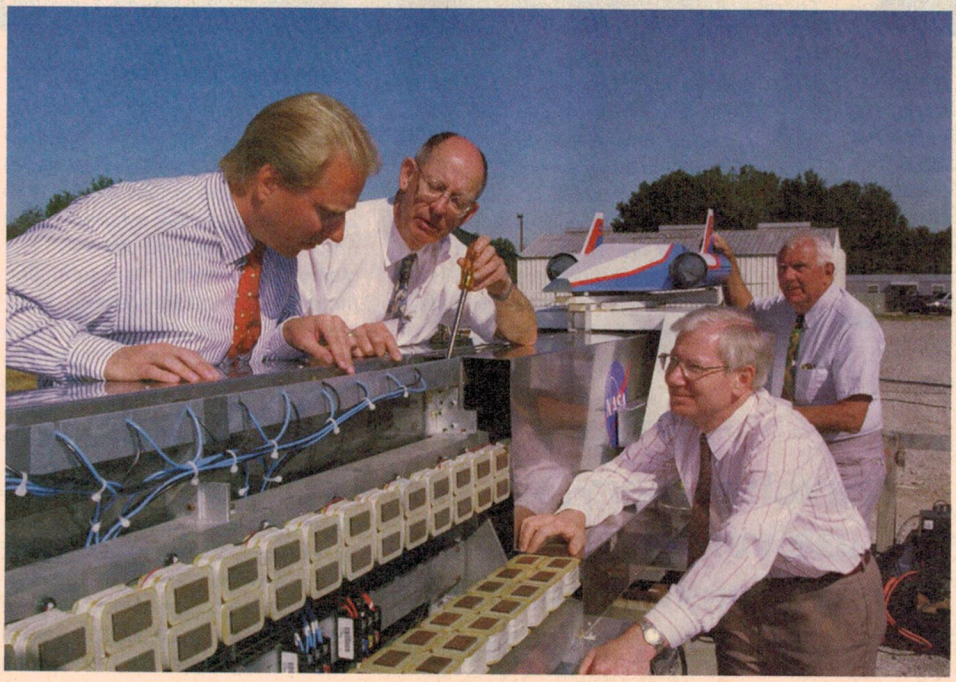
Unlike conventional linear engines, the Maglifter is propelled by power in the track. 'We are using a repulsion type of levitation where the active part is on the track,' says Edwards. 'We have mains-energised coils on the track which induce currents on pieces of aluminium in the carrier, giving a repulsion force which gives stable levitation. It requires no electrical connection to the moving vehicle.'

The next step in the ongoing project, started in 1997, will be to build a 250 metre track capable of floating and propelling a 54 tonne craft to take off.

As early as 2007, a maglev launch assist system could be used to launch small communications satellites for a few thousand dollars per kilo. And if the price of rocket launches does come down, NASA points out, more people will be going up. 'And that's when the tickets go on sale for a thrilling ride to leave the planet,' says a NASA spokesman.

## Floating trains

The closest we have so far to a viable levitation system is Japan's gift to the future of public transport — the



***Maglev researchers Bill Jacobs of the Marshall Center (left), Bill Dawson and Denis Edwards of Sussex University in Brighton, England, and George Scelzo of PRT Advanced Maglev Systems Inc. in Park Forest, Ill., are shown completing installation of the track. (Photo courtesy NASA)***

Maglev train. Developed at a cost of a staggering $2.5 billion the Japanese have their trains up and running on a test track west of Tokyo. The record speed so far attained is 552km/h in a manned vehicle run, making it the fastest floating train in world.

Maglev, a combination of superconducting magnets and linear motor technology are quiet, safe, reliable, offer low environmental impact and minimum maintenance and of course are superfast. Developed by Japan Railways (JR) Tokai and the Railway Technical Research Institute, a JR subsidiary, the maglev uses the latest super magnet technology in trains the Japanese refer to as 'linear motor cars'. When the superconducting magnets on the vehicles pass through levitation and guidance coils on the ground, a current flows and produces an electrodynamic levitating force that propels the vehicles.

Germany too is at the implementation stage of maglev trains but Japan is way ahead, explains Mr Masada Eisuke professor of electrical engineering at the university of Tokyo.

"Due in part to its huge demand for rail transportation, Japan is unique in its systematic and wide-ranging work on development of linear motor cars, including low-speed and high-speed systems, as well as its development of practical systems using linear motor car component technologies"

However after 30 years of fiddling with the new technology in a hope to regain the crown as the fastest nation on tracks, there is little indication that the maglev will make it commercially. In March 2000, all technical evaluations will be complete. They may, say the experts, prove commercially impractical for the simple reason that Maglev trains require very straight tracks.

Whatever the outcome it would be wrong to dismiss levitated, anti-gravity transport as unfeasible. The NASA project offers a tantalising glimpse of what may be in the near future — Man free of his feet of clay, floating free beyond the grasp of tiresome gravity. After all it was just over a hundred years ago that Lord Kelvin, President of Royal Society, was to utter words made to be eaten: "Heavier-than-air flying machines are impossible," he pronounced back in 1895. Redefining the impossible may become the Maglifter's stock in trade.❖

*I'll show them! This anti-gravity wave guide will make me rich! Rich I tell you! Now, what was the diameter of that Proton energy module?*

## Anti gravity devices

Meanwhile, other types of even more bizarre levitation technology are currently being tested around the globe. Their inventors hope their creations will rival the Maglifter as rocket launchers, others think they are actually only going to take us for a very different type of 'ride'.

One 'Anti-gravity' device developed by a Russian scientist has attracted NASA's $600,000 investment. NASA hopes to recreate the same experiment that claimed to block the force of gravity.

Several years ago Eugene Podkletnov, a materials scientist at the Moscow Chemical Scientific Research Centre, claimed that he had performed experiments in which a spinning, superconducting disc lost as much as 2 per cent of its weight. This got NASA excited enough to pay the Superconductive Components company in Ohio to build a 12" super-conducting disc in the hope of recreating Podkletnov's experiments successfully. As those first to realise a practical anti-gravity technology stand to make millions, it is not surprising perhaps that other industrial heavy weights such as Panasonic are also entering the race.

Working with Dr Hideo Hayasaka and colleagues at Tohoku University, Japan, Matsushita (Panasonic) is performing a set of experiments aimed at detecting anti-gravity generated by a small gyroscope. They claim to have generated anti-gravity although conventional physics says it is impossible for any object to generate anti-gravity or even to screen out its effects.

If Podkletnov and the Japanese are proved to be right it would be possible to apply their methods to rocket propulsion and revolutionise all other types of transportation. At the moment, the claimed effect is extremely weak - amounting to an anti-gravity effect of just one part in 7000.

The Japanese team who revealed their plans for an anti gravity spaceship at this year's Space Technology & Applications International Forum are positive their experiments will lead to UFO like floating transportation of the future.

"Antigravity is generated by circulating magnetic fluids in toroidal tubes where spin waves controlled by twisted magnetic fields generate positive energy," says Dr. Hayasaka

"The positive energy is converted to antigravity through the clockwise circulation around the moving direction of a spaceship."

After years of rantings from the scientific and not-so-scientific fringes on 'free energy' and 'anti-gravity machines' it is not surprising more conventional scientists are sceptical about these claims.

One Physicist, G. Modanese, explains the 'Podkletnov effect' as a characteristic of quantum gravitational effects. Two other physicists Michael de Podesta and Martyn Bull at Birkbeck College, offer alternative, non-gravitational explanations based on normal physical effects not entertained by Podkletnov. They also 'question his weighing procedure'.

Still more crankish flights of fancy, even more audacious than those above, have been greeted by universal derision by many scientists. John Searle, now elevated to "Professor John Searle" on the web, for one, claims to have invented an anti-gravity perpetual motion flying machine based on rotating magnets. This boast receives a deep sigh from Professor Steve Donnelly, editor of the British Sceptic magazine.

"It is utterly unconvincing and really is a total load of garbage, in my view. There is absolutely no reason to believe that any machine of this type would tap into energies 'locked into the fabric of the cosmos' or 'zero-point energy' or whatever. There is energy locked into matter, as Einstein demonstrated with $E=mc^2$, but you are not going to unlock it with rapidly rotating magnets."

# Terratec's M3Po MP3 audio decoder

by Graham Cattley

**Well, it looks as though MP3 has finally lost its geek status, and moved into the domestic audio market. Terratec's new M3Po Audio Decoder is a completely new component for your home stereo system, giving you instant access to hundreds of hours of pre-recorded music without the usual pile of CDs.**

Look, everybody knows what an MP3 is by now, and you probably have a bunch of them sitting on your hard drive. I wouldn't mind betting though that every MP3 you own has come off the net, and is sitting on your PC. The problem is that unless you live in front of your PC, it isn't always that convenient to listen to them.

If you're like me, you'd much rather listen to your painstakingly downloaded music through your home stereo system, rather than through a pair of PC speakers. To do this, you have to either take the PC to the stereo, the stereo to the PC, or trail a long length of wire between the two. That is, you did until the M3Po came along and changed everything...

## M3Po player

The M3Po from Terratec is a standalone MP3 decoder, and is designed to be integrated into a normal home stereo system. It can play standard audio CDs, but its main claim to fame is that it plays MP3 files burned onto CD-ROM. This is quite a significant development in home audio equipment, as it means that MP3s are now seen as a valid 'media' for domestic audio, along with tape, Minidisc, and CD.

With a reasonably modern home computer setup you could convert a whole music CD into 60-70MB of MP3 files. This means that you could burn 10 CDs worth of music onto one CD-ROM, and play it back for over 10 hours straight on the M3Po — all from one disc.

This is great, but the M3Po goes one step further — it has a spare IDE port inside so that you can install an internal hard drive that will hold as many MP3s as you care to throw at it. A bog standard 6.4GB hard drive installed inside the M3Po would hold around 100 audio CDs worth of music, with every track instantly available. More likely though, considering the low cost of hard drives these days, you'd go for a drive with something around 15GB of storage space, giving you instant access to well over 200 CDs. Better than a CD changer eh? Suddenly CDs seem to be such an inefficient way to store music...

## Burn and play

So, how do you go about getting all of these hundreds of hours of music into the player? Well it's more or less down to you recording your own MP3s on your PC, and then transferring them to CD-ROM with a CD-ROM burner. You can then play the resulting CD-R disc directly in the M3Po, or transfer the files to the player's internal hard drive (assuming you've installed one).

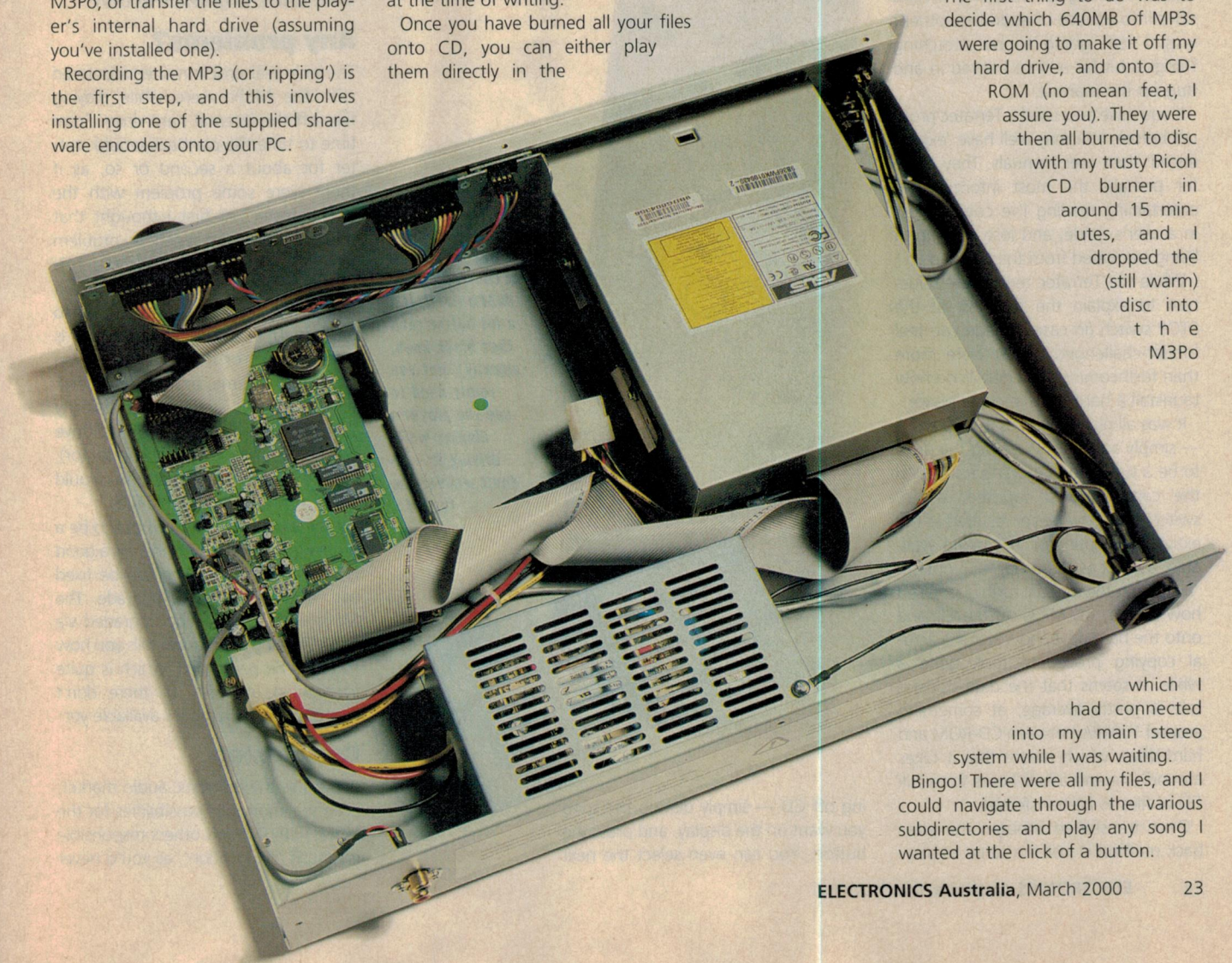
Recording the MP3 (or 'ripping') is the first step, and this involves installing one of the supplied shareware encoders onto your PC. These will convert the selected tracks on your original CD to MP3 files on your PC's hard drive.

Once you've converted your CD collection (a somewhat lengthy process — conversion typically takes half the track playback time), you'll then have to burn them onto CD-ROM. Unfortunately, the CD-ROM is the only interface to the M3Po — there are no digital inputs, in fact, there aren't *any* inputs to the player except for the CD-ROM drive.

**"go for a drive with something around 15GB of storage space, giving you instant access to well over 200 CDs"**

To burn CD-ROMs, you will, of course, need a CD-ROM burner. These have recently fallen quite dramatically in price, and you can pick up a respectable 6X unit for around $300 at the time of writing.

Once you have burned all your files onto CD, you can either play them directly in the M3Po, or, if you've installed a hard drive into the player, dump them on to that instead. This is certainly the most useful and practical option, although it is a bit slow, as you'll see later. A faster option is to temporarily install the M3Po's hard drive into the PC, copy the files over and replace hard drive back into the player. As well as being much faster, this method also does away with the need for a CD-ROM burner — and the CD-R discs as well.



***There's lots of space in there; some of it gets used up if you decide to install a hard drive though.***

## MP3 for me

I have an embarrassingly huge collection of MP3s buried on my PC, thanks mainly to the T1 Internet connection we have here at EA. I've also converted a number of my most-played CDs using a number of different MP3 encoders, and so I was deemed to be the one best qualified to review the M3Po. The fact that I was the one who swiped it off the desk and secreted it home the day it arrived had nothing to do with it. Really.

The first thing to do was to decide which 640MB of MP3s were going to make it off my hard drive, and onto CD-ROM (no mean feat, I assure you). They were then all burned to disc with my trusty Ricoh CD burner in around 15 minutes, and I dropped the (still warm) disc into the M3Po which I had connected into my main stereo system while I was waiting.

Bingo! There were all my files, and I could navigate through the various subdirectories and play any song I wanted at the click of a button.

The no-frills front panel layout would lead you to believe that there are few options with playback, but there's an extensive menu system accessed via the large multi-function knob and backlighted liquid crystal display. In fact there are so many options, settings, and play modes that it can get a little confusing... Luckily, there's a respectable remote control with a separate button for most of the main functions.

Everything was working so well, that I thought I'd move on to the next step — installing a hard drive into the player. While I didn't have any large drives hanging around without a home, I did have an old 2GB Quantum with a few bad sectors lurking at the bottom of my drawer. The ideal candidate!

With reviews, I generally try to do as much as I can without referring to the product's user manual; this gives me the chance to see just how intuitive everything is. Installing a hard drive into a piece of audio equipment was, I felt, going to be stretching things a bit far and so I caved in and dug up the manual.

If you have ever used a Terratec product before, you may well have 'experienced' their user manuals. They make for perhaps the most informal and entertaining reading I've come across in a user's guide, and lose nothing in being translated from the German.

While the Terratec team were reluctant to explain the function of the STOP switch (in case it made you feel 'under-challenged'), they were more than forthcoming with details on how to install a hard drive into the player.

It was all plain sailing as it turned out — simply a matter of setting the drive to be a slave, and plugging it in. With the case screwed together again, switching on the player resulted in the extra menu option of 'HD' being available, as well as the usual 'CD' option.

Exploring the manual further revealed how to copy my MP3s off the CD and onto the hard drive, however the actual copying procedure took quite a while. It seems that the data transfer rate is pretty average, at something around 100kB/s between CD-ROM and hard drive, which means that it takes around one and a half hours for a full CD of files to be transferred.

Once transferred though, the playback method is just the same as playing off CD — simply dial up the song you want on the display, and press the button. You can even select the next song to be played in advance while the first one is playing, and, perhaps most importantly, the M3Po can handle playlists in the industry standard '.M3U' format. With playlists you can set up any number of tracks to be played in any order, and the M3Po can use existing playlists generated by the likes of Winamp (a popular software MP3 player), or generate its own.

*'Sleek' is a term that springs to mind when you first see the M3Po. 'No-frills' is another.*

*The remote makes light work of controlling the M3Po (well, it's a lot better than that black knob, anyway), but you really need to see the player's display while driving it – so don't wander too far off...*

## Any problems?

The only real problems I encountered with the M3Po were while playing files off the internal hard drive. From time to time the playback would stutter for about a second or so, as if there were some problem with the data transfer. At first I thought that there might have been a problem when copying files off the CD, corrupting the MP3 file concerned, but repeat playing showed everything to be fine. All I can think is that there is some conflict or interrupt happening from time to time, and this interferes with playback. There is a possibility that the fault lies with my hard drive (which had the occasional bad sector), but I'm pretty sure that this would result in simply unplayable files.

If the stuttering does turn out to be a problem with the player, there is a good chance that the problem can be fixed with a simple firmware upgrade. The M3Po is designed to be upgraded via CD-ROM, and the manual tells you how this is to be performed, which is quite foresighted of them, as there don't seem to be any upgrades available yet.

## Conclusion

As well as the domestic audio market, I can see enormous possibilities for the M3Po with DJs and others responsible for music 'on location', as you'd never

have to take any CDs with you. There'd be no problems in finding specific tracks, even if they were originally spread over a number of different CDs, and playlist support means that you can set everything up in advance.

However, at the asking price of $1500 for the M3Po, there is perhaps the nagging feeling that you could do the same thing with a laptop computer running Winamp, and do a whole lot more besides. Granted, the M3Po is the first unit of its kind in Australia, and like all new technologies, the price is bound to be high to start with. I'd be inclined to wait a bit for the odd bug fixes in the next version, and see if the price falls during the next few months or so. ❖

***You'll want to stick one of these in the player – go for the biggest one you can lay your hands on.***

## Features

Playback of MP3 files directly from CD
Playback of conventional audio CDs
Additional installation space for a conventional 3.5 inch AT-bus hard drive
Supports 1S09660/Joliet and FAT16/32 file systems on CD and hard drive
MP3 data (ID3 tags) about artist, album and title displayed during playback
Supports all MPEG audio bit rates, scan rates and variable bit rate streams (8-48kHz, 8-320kb/s)
M3U format playlist support
Easy to use infrared remote control
Variable MP3 playback speed without affecting pitch
Quick access to titles using the front panel shuttle knob
Title list saved in internal RAM
Future firmware upgrades possible through CD-ROM
Uses a 32-bit RISC processor and hardware MPEG decoder
Line out (RCA)
Headphone output (6.3mm jack) with software volume control

## Terratec M3Po MP3 audio decoder

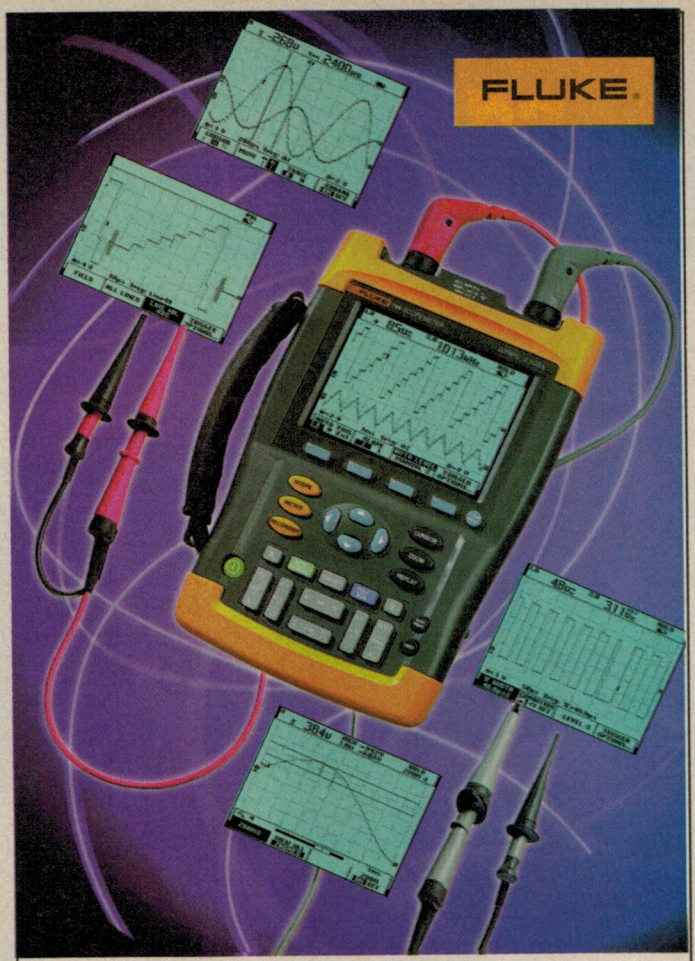
A stand-alone MP3 audio decoder designed for use as part of a home stereo system.

**Good Points**: First of its kind — brings MP3 into the living room. Easy to drive using the remote, gets all those MP3s off your PC!

**Bad Points**: You'll need a CD burner, and/or install your own hard drive. Occasional stuttering on tracks played back off hard drive.

**RRP**: $1595.

**Available**: Moore Music, 219 Napier St., Fitzroy Vic. 3065. Phone (03) 9419 0344; Fax (03) 9417 6697.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☑ Advanced trigger modes
☑ Up to 1000V isolated inputs
☑ 4 hour (NiMH) battery life
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# Mr Sony, you've done it again!

**After trying out a sample of Sony's new ultra-compact VLP-CS1 projector, Jim Rowe says he was almost blown away, especially by its potential for home theatre use. As well as taking the crown as the smallest and lightest LCD projector around, it offers very impressive performance — and at a new low price that's likely to produce some serious concern among Sony's competitors...**

## by Jim Rowe

ABOUT A YEAR AGO, I was lucky enough to review what was then Sony's smallest and lightest LCD projector: the VPL-SC50M. At the time I was very impressed, too. It offered SVGA resolution (800 x 600) and 500 lumens of output, yet measured only 314 x 218 x 107mm and weighed in at 3.7kg. As well it offered multi-sync video graphics and multi-standard video compatibility, and all for only $8418 including tax.

Needless to say since then, projector technology *has* moved on, although perhaps not dramatically. When I reviewed NEC's even smaller and lighter DLP-based model LT-84 a month or two ago, I inevitably found myself comparing it with the VPL-SC50M — partly because the new unit was 30% *higher* in price ($10,995 including tax).

But now Sony too has released a new model, and one that could well turn out to be the kind of 'market paradigm' product for which they're justly famous. The new VPL-CS1 is certainly the smallest and lightest SVGA-level LCD projector yet produced, and at 277 x 214 x 70mm and 2.9kg it competes very closely indeed with the LT-84 for the title of smallest and lightest of them all.

The VPL-CS1 isn't merely the next step in Sony's inexorable 'smaller still and lighter' crusade, though. It also happens to deliver a very impressive level of performance. For example it produces a healthy 600 ANSI lumens of light output — 20% higher than the SC50M — combined with the same SVGA graphics resolution and 600 lines of horizontal resolution for video. Not to mention the same ability to detect and lock onto all common video formats (PAL, PAL/M and /N, NTSC, NTSC 4.43, Secam etc)...

There are a number of other advantages over the previous model, too. These include RGB or Y/Cr/Cb component video inputs, as well as the S-video and composite video inputs provided on the SC50M; a wider range of multi-sync computer graphics display modes (32 in all), with virtually any horizontal scan rate from

### Brief Specs

**Projection System:**
Three 0.7" TFT LCD panels
**Lamp:**
120W UHP
**Light Output:**
600 ANSI lumens
**Resolution:**
RGB 800 x 600 pixels (SVGA)
Video 600 TV lines
**Colour System:**
PAL/NTSC/Secam
**Power Consumption:**
190W max.
**Dimensions:**
277 x 214 x 70mm
**Weight:**
2.9kg.

15kHz to 91kHz and vertical rate from 43Hz to 85Hz; digital keystone distortion correction for computer graphics display; a built-in USB hub, which also allows its IR remote to act as a USB mouse for your PC; and significantly lower cooling fan noise.

Even better news, though, is that despite these very significant improvements in both size and performance, Sony has also managed to bring down the price of the CS1 quite markedly as well. It's only $5490 including tax — just on 35% less than the SC50M, and half the price of the new LT-84. I don't know about you, but I'm impressed!

Perhaps the first thing you notice about the CS1, apart from its tiny size, is its elegant all-in-one construction. The front of the case, which covers the lens and IEC mains connector for transport or storage, unlatches and folds down to become the front support during projection. At the same time a smaller 'tilting bail' unclips and swings down at the rear, to provide the remaining support. Together the two lift the case up about 32mm from the table or stand surface, to allow plenty of clearance for cooling air entry.

The efficient 1.3:1 zoom lens (28.7 - 37.4mm) has manual zoom and focus, with easy access to the two rings via a neatly sculpted 'valley' just above the lens axis. Also on the top of the case are the various control buttons, and four status LEDs.

**Within a couple of minutes I had the projector opened up for business, purring away and displaying a menu image from my DVD player...**

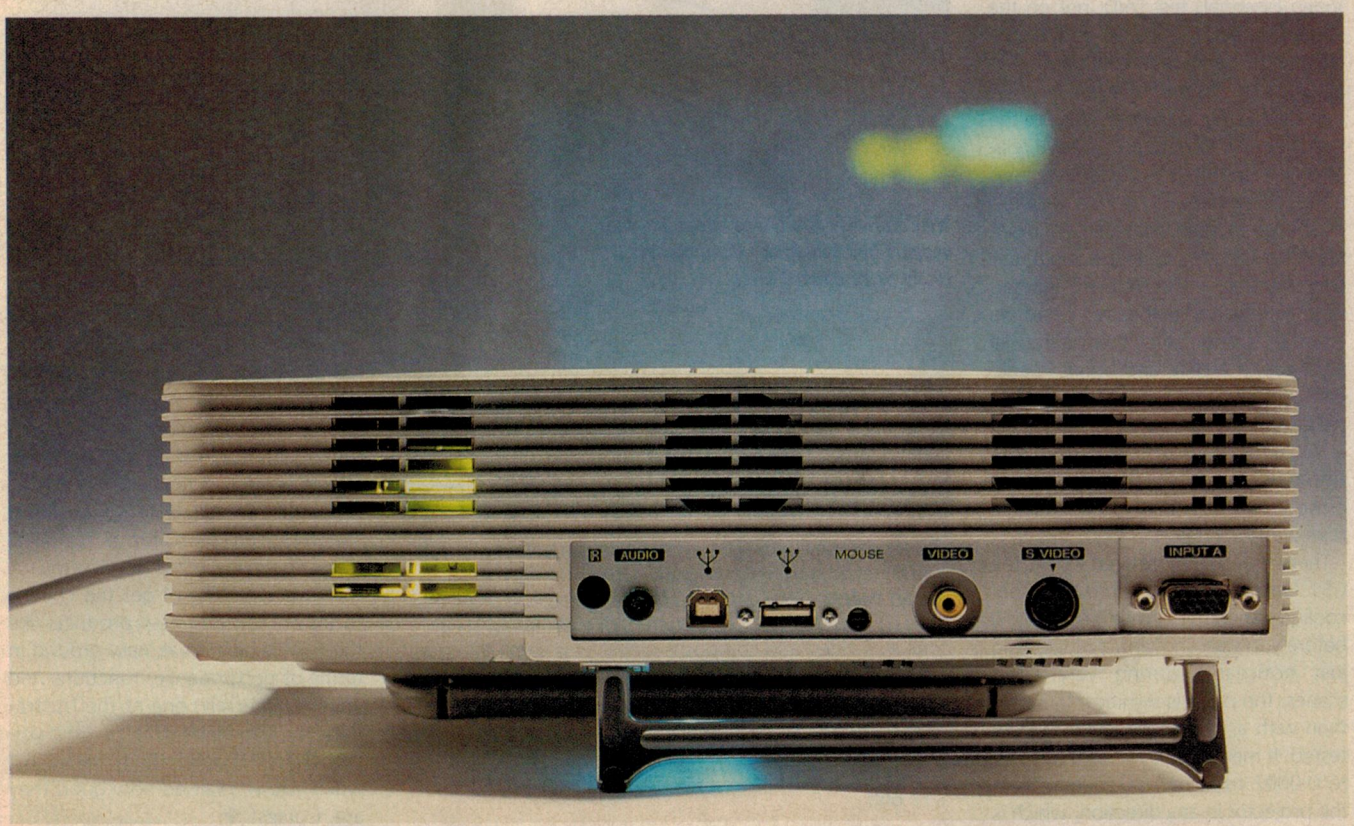
All of the signal inputs and outputs are along the rear of the case. These consist of composite video and S-video input sockets, a 3.3mm stereo jack for audio inputs (the projector has two built-in 0.5W audio amps and tiny 36mm speakers) and a high density 15-pin socket which doubles for both RGB computer graphics input and RGB/component video inputs. In addition there are 4-pin 'downstream' and 'upstream' connectors for the built-in USB hub, and a miniature 6-pin connector which can be connected to the PS/2 mouse connector on a PC using the supplied cable. Other cables supplied include a 15-way computer graphics cable, a USB data cable and of course a mains cable.

By the way the CS1 comes complete with a very small and neat IR remote control, which can double as a computer mouse. It also comes with a Windows 98 control control utility for the USB functions, on a CD-ROM. There's also a nice padded carrying bag with shoulder strap.

## Trying it out

Thanks to the nice people at Sony Australia, I've just been able to try out one of the very first VPL-CS1 units to arrive in Australia. It was only available for a few days, but that was enough.

Just for the record, I tried taking it straight out of the carry bag and setting it up to show a movie, without even referring to the user manual — the acid test for a product in terms of intuitive operation. This turned out to be dead easy and straightforward, too. Within a couple of minutes I had the projector opened up for business on my stand, purring




***At the rear there's the usual composite and S-video inputs, plus a data graphics input and a hidden component video input. Also visible are stereo audio inputs, the USB hub's in and out and a mouse connector.***

away and displaying a menu image from my DVD player. Finding the correct zoom and focus settings was also simple, and then I was able to sit back and watch the movie. An auspicious start, indeed.

Needless to say I did refer to the manual during the few days I had the projector, to check on its functions and capabilities. I also tried the projector quickly with a computer, to see how well its inbuilt standards-conversion circuitry compressed higher-res graphics modes down to 800 x 600. The answer is: very nicely.

Of course I was particularly interested in getting a good idea of the CS1's suitability for home theatre use, so I also tried it out with not only the DVD player but also my laserdisc player. So overall this allowed me to try it with both PAL and NTSC, using S-video and composite video signals, and also a variety of high quality software.

I didn't have a source of component video available at the time, but frankly the performance with S-video was so good that I doubt whether the results with component video could be much better. With S-video there wasn't a trace of colour artifacts with the 'moving Fresnel zone plate' pattern on the Video Essentials test DVD, nor on the static frequency response patterns — despite the response extending very cleanly to beyond 450 lines.

The light output seemed close to the specified 600 lumens (I only have relative measurement capability), and although this is by no means as bright as the up-market 'professional' models, it's still plenty for displaying a nice bright image in the subdued lighting of a typical home theatre. I had no trouble filling my 1.8m-diagonal screen with a clear and bright image, with a throw of 3.6m and the lens at maximum focal length.

The uniformity of screen illumination was also very good, comparing closely with LT84 DLP unit I reviewed recently.

There was one more area where the CS1 was particularly impressive, too: cooling fan noise. While still audible before you start showing a movie, and just noticeable during very quiet scenes, the noise is significantly lower than with any other projector I've yet tested. It measured only 56dB (relative to 0.0002 microbar) at 300mm from the projector in any direction, which is commendably quiet.

Overall, then, I was very impressed indeed with the Sony VPL-CS1. Despite its tiny size and weight it delivers a high level of performance and would make an excellent projector for home theatre use as well as portable presentation work. All of which seems doubly attractive when you consider the breakthrough that Sony has been able to achieve in terms of its price...

One of the really nice things about reviewing products for a technical magazine like *Electronics Australia* is that every so often I get the chance to try out exciting new products like the CS1, which break new ground in terms of performance, functions and price. Conversely, one of the frustrations of the same role is that you then have to send them back, just when you've realised how good they are. Curses! ❖

***With the case front/lens cover and rear support bail folded up, the projector is ready to be carried away...***

## Sony VPL-CS1
### Video/Data Projector

A very compact and light multimedia projector with 800 x 600 native resolution and 600 lumens of light output.
**Good Points**: Very good image resolution and smoothness of illumination. Component video compatibility as well as S-video and composite video, plus some 32 data graphics modes up to SXGA. Low cooling fan noise, new low price.
**Weak Points**: Very little, really.
**RRP**: $5490.
**Available**: Sony A-V dealers, or contact Sony on 1800 017 669.

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This handy, light weight keypad plugs into a standard serial port and a small TSR program captures the keystrokes and directs them to the keyboard buffer. The keypad has a DB9 female plug.

Cat. 8741 **19 Key Keypad - Serial Connection** $109

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Break the 8.4Gb drive barrier and get a lot more speed. Our Ultra DMA66 IDE controller has two enhanced Ultra DMA 66 IDE ports, it supports up to 4 IDE devices and co-resides with existing motherboard IDE ports i.e. 8 IDE devices on one computer. The performance improvement is dramatic!

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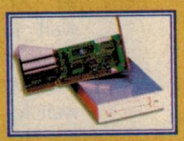

This high performance PCMCIA Drive provides two front-access sockets on the 3.5" front bay and is connected to the Interface Adapter by ribbon cable. The drive supports DOS & Windows 3.1x, Windows95/NT 3.5x & 4 and OS/2 Warp 3.0 & 4.0.

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## VGA to Video Converter

High quality at an affordable price, this totally external unit does not require software drivers, hence, no software clashes. The scan rates up to 100Hz are supported for 640x480 resolution, up to 85Hz for 800x600 resolution, and up to 75Hz for 1024x768 resolution.

Cat. 3102 **VGA to Video Converter** $379

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Internal PCI Plug & Play 5 Port hub and LAN card does not require external power supply. One port can be used as an uplink port for easy expansion, or used for hub connectivity at the server.

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## Blood Pressure Monitoring System

DynaPulse is a clinical accuracy blood pressure and pulse monitoring device that connects to your computer via a serial port. It displays the actual blood pressure waveform on screen as a visual confirmation of measurement accuracy. More importantly, systolic, diastolic, & mean arterial pressures are actually measured rather than calculated. The home version maintains data for up to six people.

Cat. No. 16000 **Blood Pressure Monitoring System** $369

## Mouse Tablet

The Mouse Tablet is an input device that allows you to choose between an easy-to-use, high resolution, trackball-free mouse or a precise stylus pen. Both pointing devices are implemented with cutting-edge electromagnetic technology, and have a resolution up to 4064 LPI. The three-button stylus pen provides pinpoint accuracy and writing, drawing & painting abilities. Bundled software includes NetProbe (a built-in Internet direct access utility), PenSurfer and PenGuard.

Cat. 8676 **Mouse Tablet** $189

## 2 Port USB PCMCIA Card

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## Windows Terminal

This windows based terminal is suitable for both NT Terminal Server & Citrix Metaframe. It supports Microsoft's RDP and Citrix ICA3 protocols. Ports are DB25 parallel, two DB9 serial, two USB, VGA DB 15, PS/2 mouse & keyboard ports & audio in & out. Just add a monitor, keyboard & mouse.

Cat. 1214 **Windows Terminal** $1299

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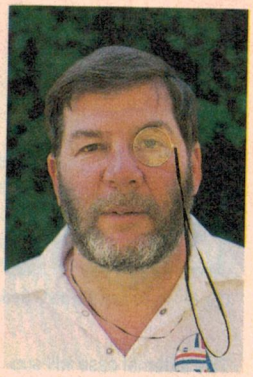
# Y2K Fizzer!



Y2K has come and gone, which is no great surprise, at least to me. Permit me to quote from the April 1999 Moffat's Madhouse column:

*"It's now time to stick my neck out. I sometimes work as a for-hire PC guru, helping people through hardware and software woes. I run a little Y2K test program on every computer I visit, and my experience suggests one thing: for PCs at least, most of the fears are a load of hooey. I suspect that saying such a thing will bring calls to Electronics Australia demanding my immediate dismissal. That's fine, if the management will just wait until the year 2000 arrives. If I'm right, they can give me a nice pat on the back. If I'm wrong... Well, my job won't be good for much anyhow if the world ends."*

So now, ten days after Y2K, we are still here. I don't want to say "I told you so" - rather, I think we should start looking at how a supposedly intelligent world population got sucked into such a mighty cloud of hype. Maybe we can work out ways to prevent it happening again.

On New Year's Day the penny dropped slowly at first. I woke at 5:30am New Year's Eve to go to the loo, and flipped on the radio as I got back into bed. An American journalist was interviewing a reporter from a radio station in Auckland.

USA: "What happened with Y2K?"

NZ: "Absolutely nothing."

USA: "Didn't anything go wrong at all?"

NZ: "Yair. It's been raining all day, and this is a holiday!"

Later in the day I received a phone call from my daughter in Sydney.

AUS: "Happy New Year, Dad!"

USA: "Happy New Year, Jen. How'd you go with Y2K over there?"

AUS: "No trouble at all. Everyone here is so optimistic!"

Well, so much for the end of the world. A pattern was developing as the new millennium swept around the globe: No problems. Nothing. Nothing.

Later that day I was working on a system to display a countdown clock for a Millennium Bash we were producing at the local TV station. I had my GPS receiver (Dec/Jan EA) connected to an outside antenna, and also linked to a computer using the G7TO direct access program. The computer displayed the latitude, longitude, and exact time once a second.

There were two reasons to choose this system:

1. since the time was derived from atomic clocks orbiting in the GPS satellites, it would be the most accurate time available anywhere in the world, at least to civilian users.
2. since the whole GPS system was based on very complex time measurement, any Y2K problems would be most likely to show up here.

As I watched the GPS system run I realized that the computer was displaying GMT, rather than local time. So the 'world clock' Y2K rollover would happen at 4:00 PM, my local time, or at 7:00 PM in New York and Washington. At this stage the news media were reporting that most planes would be grounded soon before midnight. Even a space shuttle had its launch time time rearranged to avoid the dreaded midnight hour.

When 4:00 local time rolled around, I had the GPS receiver sitting in the TV station parking lot with a camera trained on its 'setup' display. As the potential end-of-the-world approached, I hit the record button and stood back, waiting to die. But again, nothing happened. The GPS rolled over without missing a beat. Airplanes flying overhead did not fall out of the sky. Boats did not sink. Life went on, despite the doomsayers.

By the next morning it was obvious that Y2K doom had simply not happened. But the hype went on unabated. "Midnight wasn't important. Just wait until businesses re-open on Monday morning. THAT'S when the crash will come." I personally couldn't wait for Monday because I was hungry, not being clever enough to lay in some storable Y2K food beforehand. A New Year's Day trip to the supermarket produced plenty of food, purchased with my trusty Visa card.

As of this writing, nine days into the Millennium, 25 percent of American small businesses have NOT gone

PENINSULA DAILY NEWS

$1.25 Sunday — Port Townsend-Jefferson County Edition — January 2, 2000

**Y2K OK!** Jefferson County rings in 2000 with no 'bugs'

By Adriana Janovich
Peninsula Daily News

PORT TOWNSEND — Millions watched and waited to see if the Y2K bug would strike different times zones around the world New Year's Eve.

By the time the countdown kicked off on the West Coast, few people were still holding their breath.

Jefferson County emergency services personnel welcomed the dawn of the new millennium with a sigh of relief.

Many more Jefferson residents celebrated with cheers and champagne.

"There was a general sense of

ALSO...

■ *State, Microsoft technicians watch nothing happen* A7

century and try to turn back the clock to 1900 — a year in which they didn't exist — and shut down.

But the vast share of the world's computers switched to the new century like humans did.

Petzoldt said about 150 people celebrated the dawn of 2000 at Sirens to the beats of the local band Bayou Boogie. Guests emptied a nine-liter bottle of champagne during a midnight toast.

"It was amazing. We had a good night," he said.

While revelers enjoyed festivities at local establishments and private parties, many city officials spent the night at work.

Bob Hamlin, the Y2K information coordinator for Jefferson County Emergency Management, manned the county's Emergency Operation Center at the sheriff's office in Port Hadlock from from 2 p.m. Friday to 2 a.m. Saturday.

"I was there the whole time. There was absolutely no problems," said Hamlin, who has been in emergency management since 1971.

"Everything worked fine. I expected a little more sociological impact because of the media hype. I expected opportunists — people doing things just to see how peo-

broke, despite warnings from the 'experts'. The stock market has NOT crashed — in fact it's gone up. I'm sitting here typing away on my computer, which displayed "January 1, 2000" exactly when it was supposed to. Now I've got to figure out what to do with those six cartons of beer I bought "in case the water supply should fail". I'm sure I can find a use for them.

## Tom stirs the pot

Three Moffat's Madhouse columns in 1999 — April, June, and November — raised questions about the validity of the entire Y2K culture. These of course made some people uneasy, especially those who were profiting nicely from the sale of Y2K goods and services. Some people were moving to different towns to escape Y2K dangers, and others stayed put, but at a price.

An advert, still on the internet as of last night, offers a complete Y2K survival solution: A solar array to provide electric power during the expected blackout, a 750 amp/hour battery, an enclosure to protect the battery from the elements, an inverter to convert the battery power to AC — But wait! There's more! The offer even includes a fridge/freezer that runs on LPG to avoid dependence on any electric power at all. The price of this package: $US8199.00 plus shipping.

Getting back to basics: the Y2K industry traces its roots to an alleged COMPUTER problem which was described in some detail in the April 1999 Madhouse column. Briefly, Y2K guru Dr. Gary North said "most" of the world's desktops would fail, matching his warning about mainframes. But this just didn't add up to reality. Almost every PC computer in the world contains a CMOS chip called the MC146818, which stores hardware information specific to its computer host. The chip also has a nice simple digital clock which runs continuously from a backup battery.

Here's where the experts went a little haywire: they saw the MC146818 able to store, and count, everything from seconds up to years. But there was nowhere to store the century; thus at the rollover from 99 the chip would go back to 00, as in 1900.

Wrong! The MC146818 does indeed store the century, but somewhat removed from the rest of the day/time registers, at location number 50. The earlier registers are arranged to click each other over, just like the odometer on a car speedo. But they aren't actually connected to the century register 50. It's only a place to store a number, not count it.

Recent computers' BIOS operating systems know enough to manually click over the century register when the year goes to zero. This means the computer will correctly follow the clock into the next century. Older BIOS implementations *read* the century register to generate the current date, but they do not *increment* the century automatically. The user has to do this by simply typing in the correct date sometime after the New Year. Either way, nothing actually fails. It's no different from setting the clock going into or out of daylight savings time.

**Average people don't understand computers, and if they don't understand something, they don't trust it, and if they don't trust it, they fear it.**

The above information is not particularly complicated, and it is public knowledge. I learned about it by consulting a freely available Motorola data sheet. Why were people like Gary North, with 'Doctor' before his name, unable to figure this out? Or was it more convenient not to figure it out, thus enabling a year-long atmosphere of fear that made a lot of people very wealthy?

Average people (not EA readers!) do not understand computers. And if they don't understand something, they don't trust it, and if they don't trust it, they fear it. They do understand that computers are involved in every facet of our daily lives, and they fear the consequences if a computer should suddenly run out of control, even due to confusion over the correct date. Especially in the American culture, fear generates dollars. That's why television news is filled with advertising for various potions and medications that you can't do without. If you don't buy, you gonna die!

It didn't take long for the Y2K computer bug to evolve into the Y2K power-station bug (blackout!!!), the Y2K financial bug (economic collapse!!!), and the Y2K retail bug (starve to death!!!). Plenty of merchants moved in to attend to these 'catastrophes' in advance, offering to sell you gold as a buffer against economic woes, stored food for your belly, generators, and even weapons against those less fortunate people who might try to take your stuff away from you.

PC computers weren't the only villains in this story. Back in the fifties, memory was very expensive, so clever programmers did their best to minimize the use of it. One easy way was to store the year in only two digits, since a 1950's computer wasn't likely to be around at the next turn of the century.

The language of choice in those older mainframe computers was COBOL, which apparently has a two-digit date limitation too. But one must seriously ask - how many computers and programs of this vintage are still in use? Soon after the New Year I heard an academic from the University of British Columbia (Canada) saying that the average age of all software, before it is replaced, is three years. If that is true, COBOL software still in use would be very rare indeed.

## Fear is the key

Regardless of claims and counter-claims, a small business association with over 500,000 members has reported ONE possible Y2K computer bug among its members. That's a far cry from MOST of the PC's failing, as predicted by Dr. Gary North. Even Microsoft reported that on New Year's Eve they had several thousand tech support people on duty, just in case. Just in case of what?

It does indeed seem that American commerce is strongly founded on fear. Y2K became almost the 'fear of the century', possibly because over $250 billion was spent on Y2K remediation around the world. Ah, to be a computer consultant! Interestingly, many developed and undeveloped countries balked at jumping on the Y2K bandwagon, seeing it as American hype. Now it turns out that their computer failure rates are very similar to other countries that went whole hog with Y2K treatments. What does that tell us?

So a very expensive Y2K turns out to be a flop. But there are some other dangers, much more real than Y2K, which seem to be ignored because nobody's yet figured out how to make money out of them. One of these is global warming. Evidence has been pouring in

*(Continued on page 91)*

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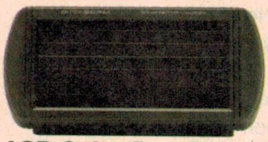

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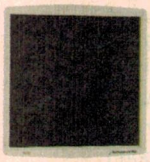

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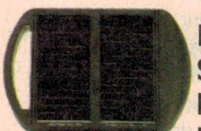

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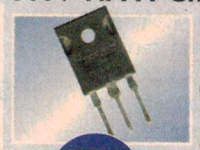

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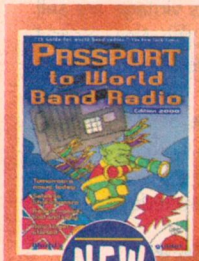


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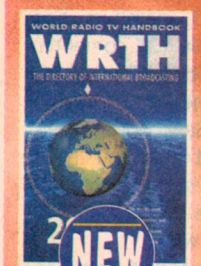


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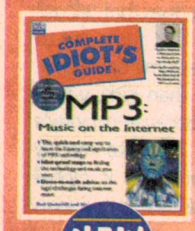


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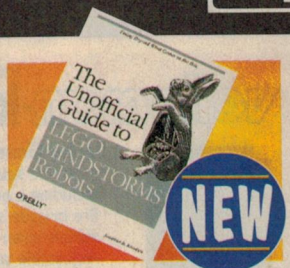
*K 1480*

LEGO MINDSTORMS **$378**

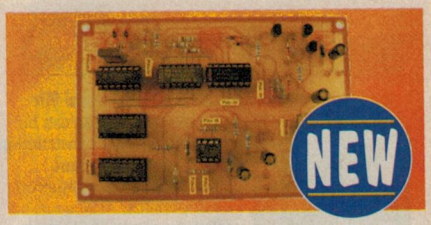



## Unofficial Guide to LEGO Mindstorms

Discover how to get the most out of your LEGO Mindstorms robot and how to take them to the next level. Hands-on guide to using alternative programming environments.

*B 7700*

**$49.95**




## Audio/Video Generator Kit

This handy test generator produces a standard monochrome video signal with a 4-step greyscale pattern, as well as a 500 Hz audio tone. Ideal for testing VCRs and video monitors. Comes with PCB and components only.

*K 7341*

SILICON CHIP Jan '2000 **$24.50**

## Sine/Square Wave Oscillator Kit

This affordable and accurate sine/square wave signal generator covers the frequency range from 2Hz to 20kHz and is suitable for a wide range of audio applications. Features constant output amplitude as you sweep over each range. Kit supplied with case, front panel, PCBs, and all electronic components.

*K 7338*

EA Feb '2000 **$41.80**

## Car Digital Voltmeter Kit

This digital voltmeter will help keep tabs on the condition of your car's battery and charging system. Features a 3-digit LED display with automatic dimming. 12V or 24V operation. Kit supplied with case, front panel, PCBs, and all electronic components.

*K 4209*

SILICON CHIP Feb '2000 **$46.80**

## Hot Chip Starter Pack

Unbelievable value! The new Hot Chip™ Starter Pack includes the Hot Chip™ microcontroller (Atmel RISC chip) with 8MHz clock speed, Serial cable, Parallel cable, Quick Start manual and hints, extensive software (Development System, Basic Compiler and Assembler) and on-line help.

*K 1430*

**$129**

## Laser Pointer 1mW

Lightweight, compact and easy to construct. This laser pointer features adjustable focus and an output of 1mW. Kit supplied with laser diode module, hardware, batteries and a professional looking laser pointer case.

*K 1048*

SILICON CHIP Jun '96 SAVE $10 **$29.80**

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Our rigorous in-house kit testing process ensures that any Dick Smith Electronics kit will have been substantially debugged before release. This process may sometimes delay our kits. We're so sure that they are worth the wait, that we'll offer a genuine 10% discount off the price of any new kit, provided that a fully paid order is placed after the release of our advertised offer and prior to stock being initially received in our retail stores.

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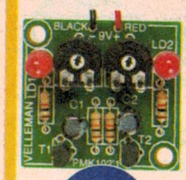
# Where do you go for Velleman kits?

velleman-kit HIGH-Q

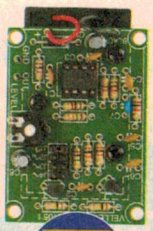



NEW

### Flashing LED Mini Kit
- Simple minikit that can be used for model construction.
- Supplied with pre-cut circuit board and required components.
- Power source: 9V battery (not supplied).
- Features adjustable flashing speed.

K 1323

**$5.80**



NEW

### Signal Generator Mini Kit
- Signal output produced includes sine wave, triangle and square wave.
- Signal frequency approx. 1KHz fixed.
- Supplied with pre-cut circuit board and required components.
- Power source: 9V battery (not supplied).

K 1326

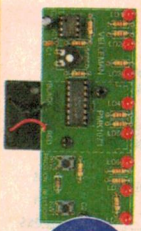
**$9.80**

NEW

### Metronome Mini Kit
- Features LED beat indication.
- Adjustable volume and beats per minute.
- Supplied with pre-cut circuit board, speaker and required components.
- Power source: 9V battery (not supplied).

K 1327

**$12.80**

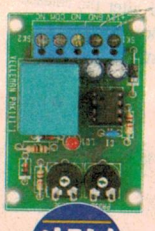


NEW

### Running Light Mini Kit
- Features different LED running effects with adjustable speed.
- Supplied with pre-cut circuit board, 8 LEDs and required components.
- Power source: 9V battery (not supplied).

K 1328

**$12.80**



NEW

### Timer Mini Kit
- Used for intermittent operation of circuits and equipment.
- Pulse time: 0.5-5s.
- Pause time: 2.5-60s.
- Supplied with pre-cut circuit board & required components.
- Power source: 12V DC.

K 1331

**$12.80**

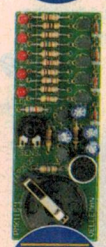
velleman-kit HIGH-Q

NEW

### Sound Generator Mini Kit
- 4 terrific sound effects including a police siren, fire brigade siren, emergency vehicle siren and machine gun.
- Adjustable sound pitch.
- Supplied with pre-cut circuit board, PCB speaker and required components.
- Power source: 9V battery (not supplied).

K 1332

**$16.80**

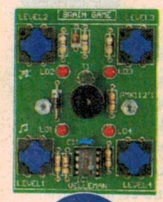


NEW

### Sound Level Mini Kit
- Pocket sound level meter features adjustable sensitivity.
- Supplied with pre-cut circuit board, 5 flashing LEDs, incorporated microphone and required components.
- Power source: 3V battery (not supplied).

K 1334

**$12.80**

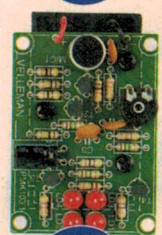


NEW

### Brain Game Mini Kit
- 4 LEDs and 4 push buttons provide hours of fun.
- Aim of the game is to repeat the pattern that is generated at random.
- With 4 difficulty levels.
- Microprocessor controlled.
- Power source: 3 x "AA" batteries (not supplied).

K 1337

**$29.80**

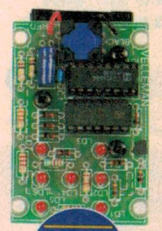


NEW

### Sound Detector Mini Kit
- 4 high intensity LEDs light up and react simultaneously on every sound.
- Use as sound indicator or simple sound-to-light unit for music.
- Supplied with pre-cut circuit board and required components.
- Power source: 9V battery (not supplied).

K 1324

**$9.80**



NEW

### Electronic Dice Mini Kit
- Electronic dice with LED indication that rolls out slowly when the touch button is released.
- Use it with all your board games.
- Supplied with pre-cut circuit board and required components.
- Power source: 9V battery (not supplied).

K 1330

**$12.80**

**Two international veterans of electronic kit supply, Velleman of Europe and Dick Smith Electronics, have allied to provide unparalleled choice to Australasian kit enthusiasts. The Velleman kit range has everything from these simple, fun Mini Kits to high-end glass audio. Watch these pages for more exciting Velleman product releases over the coming months.**

velleman-kit HIGH-Q

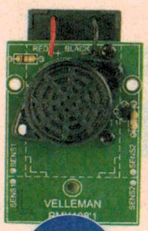
velleman-kit HIGH-Q

NEW

### Cricket Mini Kit
- Fun minikit to simulate a hot Summer night.
- Automatically activates when in the dark.
- Supplied with pre-cut circuit board and required components.
- Power: 9V battery (not supplied).

K 1325

**$12.80**

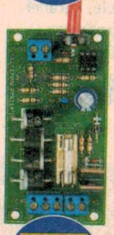



NEW

### Water Alarm Mini Kit
- An alarm sound is activated when water is detected.
- Supplied with pre-cut circuit board, alarm buzzer and required components.
- Power: 9V battery (not supplied).

K 1329

**$9.80**



NEW

### Light Organ Mini Kit
- Make lamps flash to the rhythm of the music.
- Operates at a safe, low voltage level.
- Features optically isolated speaker input and adjustable sensitivity.
- Supplied with pre-cut circuit board & required components
- Power Source: 12V – 24V.

K 1333

**$16.80**

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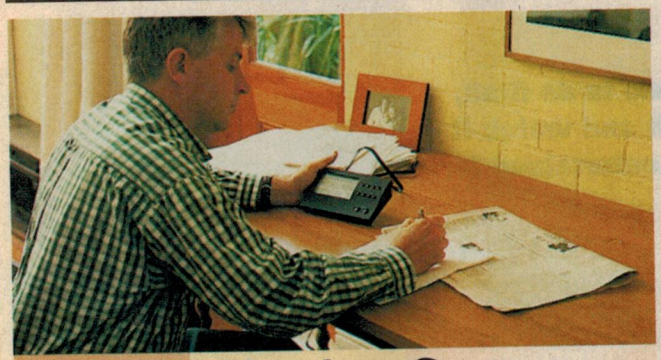
# Where do you go for books, test equipment and more?

DICK SMITH ELECTRONICS



## Deluxe Weather System

Electronic weather station lets you monitor air temperature, relative humidity, windspeed and direction, barometric pressure, rainfall and more. Can be connected to a PC for more advanced weather studies.

D 3960

**$499**

## Infra-red Thermometer

Measure temperature from a distance with this portable, compact unit. Features backlit display, auto hold and auto power off functions, a 3.5 digit LCD display and low battery indicator.

Temperature range: -20°C to 260°C
Display resolution: 1°
Measurement rate: 2.5 times per second
Field of view: 65mm @ 1m
Response time: 1 second
Emissivity: 0.95 (pre-set)

Q 1448

**$148**

SAVE $50

## 34 Range Digital Multimeter

With 3.5 digits and large pop-up display for adjustable viewing angles. Features diode, continuity, and transistor test, capacitance and low battery warning.

Q 1429

**$39**

SAVE $30

## 23-Range 3.75 Digital Multimeter

Features data hold auto power off, resistance to 32M ohms, bargraph and much more.

Q 1428

**$59**

SAVE OVER $20

## HTML Complete

This book contains the essentials you need to know about creating and modifying Web pages with HTML. Features a Master Reference of every HTML tag in alphabetical order.

B 7603

**$29.95**

## 1 Farad 5.5V DC Supercap

Super capacitor with high capacitance and low leakage. This Japanese made, low ESR electrolytic capacitor is used mainly in memory backup.

R 4900

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## Programming and Customising Basic Stamps

This book and CD-ROM gives a comprehensive tutorial on the easy-to-use BASIC Stamp microcontroller.

B 4807

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## SAVE 50% on these items

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That's where you go!

# SPIN FX

## The LED Display with a Twist

**What can we say? This fun little project seems to do it all, patterns, running messages, animations... Sit and watch it or throw it at the TV, the SPIN FX will keep you entertained for hours and your friends dazzled for weeks**

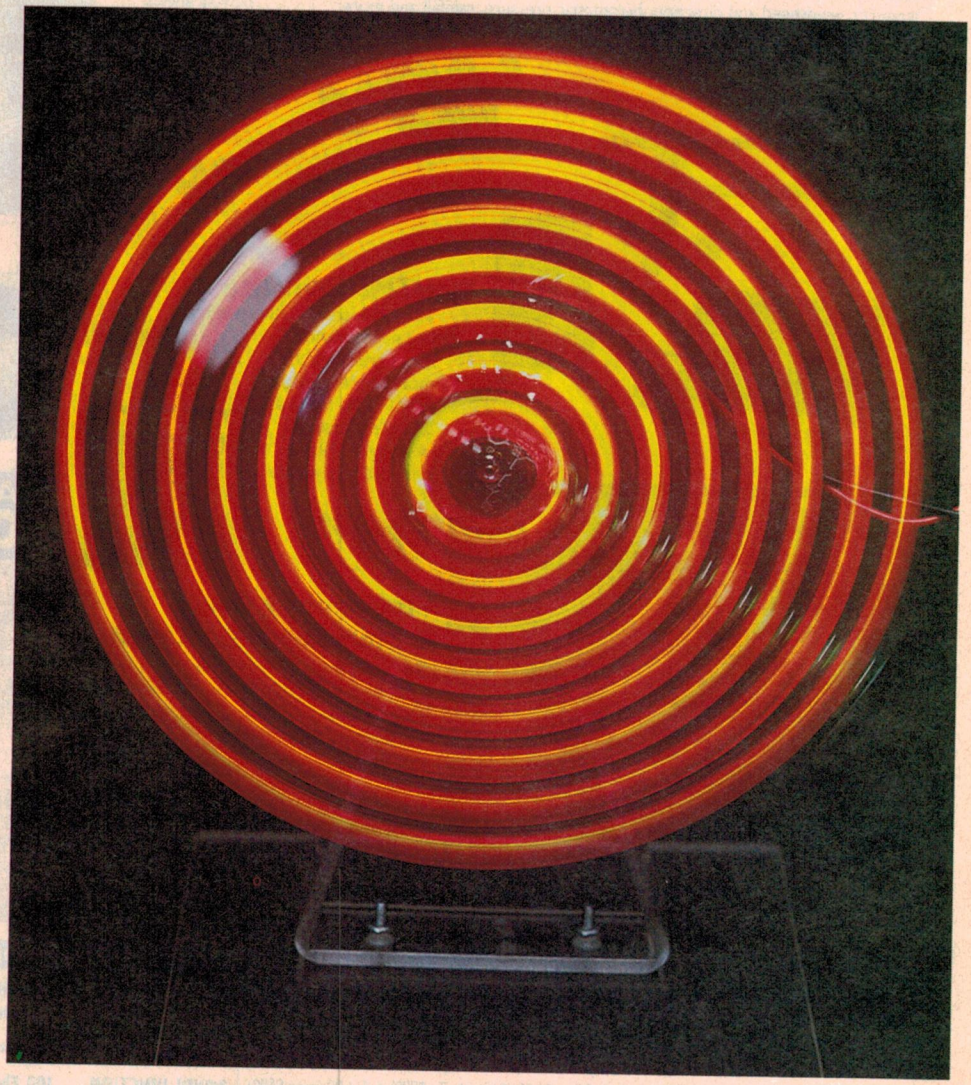
**by Nick Stone**

Whether you're a beginner to electronics, or a professional engineer, I'm sure you'll all agree with me when I say that LEDs are just *cool*.

Only your imagination (and your budget) limits the number of gizmos that you can make with them! SPIN FX is a microprocessor based LED display that can generate as many psychedelic patterns and displays as you can bear to watch. It comes with a set of pre-programmed patterns, although with a bit of ingenuity you can quickly learn to program your own. And apart from being nice to look at it does have practical uses too; for instance, it could be placed in a shop window at night to attract attention.

This design is quite novel in that with only a handful of LEDs in a simple circuit you can create virtually an unlimited (well lots anyway!) number of trendy displays. How, I hear you ask? Well, the trick is that the circuit board is actually spinning quite fast around on the shaft of a motor. This causes each LED to trace out a circular path, and when the LED is on it creates the effect of a solid glowing ring of light. Not convinced? Just take my word for it, it works.

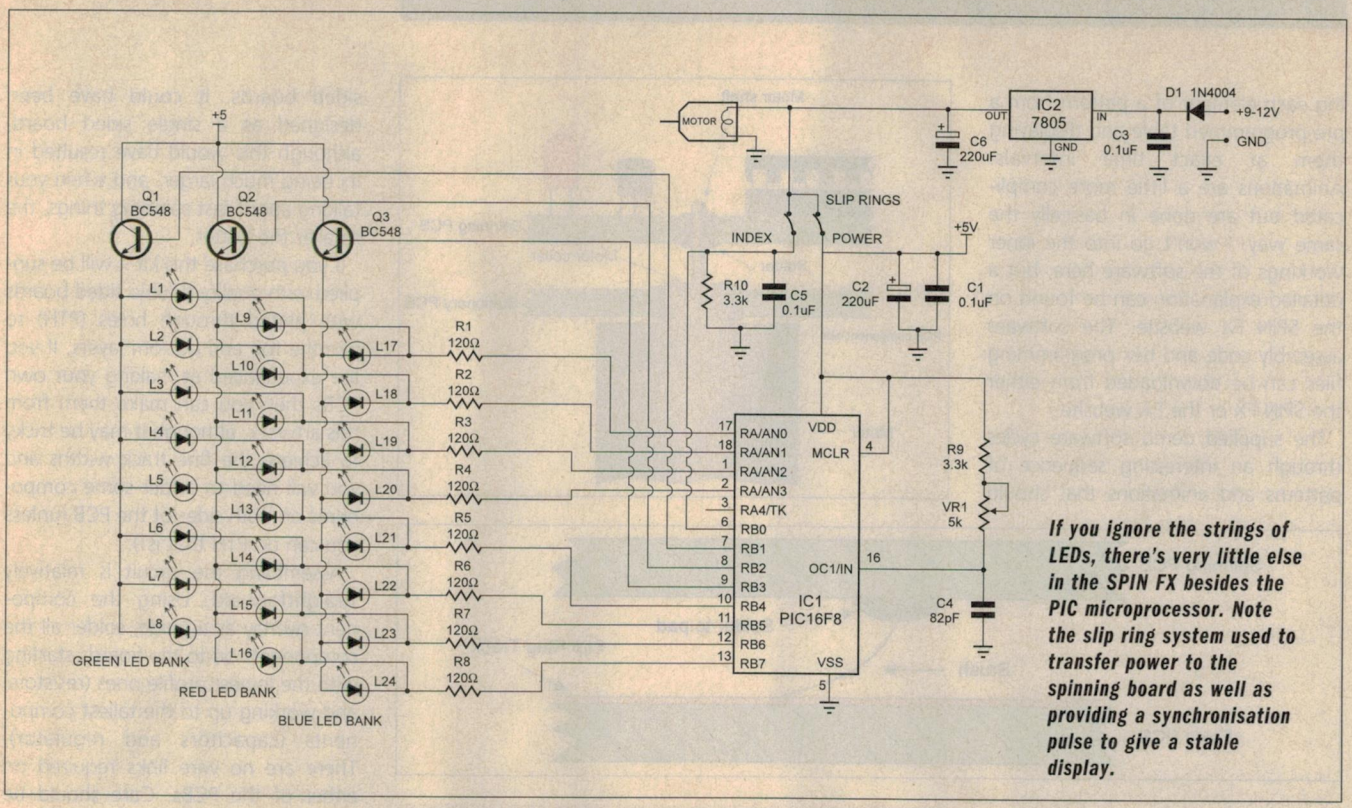
OK now lets get into to the fun stuff.



***It is hard to reproduce the SPIN FX' spectacular display on a magazine page, but we can assure you that you've never seen anything like it before. Running text, animated graphics and other eye catching displays are possible, and you can program your own!***

### How does it work?

SPIN FX consists of two circuit boards; on the first of these is a voltage regulator, a small DC motor and a circular slip ring track. The second PCB mounts on the spindle of the motor and maintains an electrical connection with the first PCB via the spindle and a brush




***If you ignore the strings of LEDs, there's very little else in the SPIN FX besides the PIC microprocessor. Note the slip ring system used to transfer power to the spinning board as well as providing a synchronisation pulse to give a stable display.***

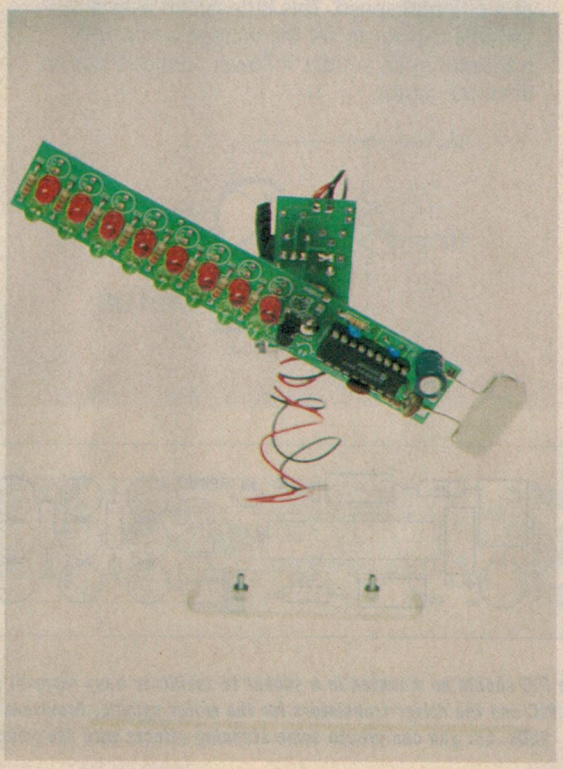
that contacts with the slip ring track. This second board has a PIC microprocessor that controls up to three rows of eight LEDs. The microprocessor flashes the LEDs on and off in a certain order with precision timing so when spinning it creates the illusion of an image. That's all there is to it.

Looking at the circuit diagram you can see power (9-12V) comes in and goes through a polarity protection diode to a +5V regulator. This +5V drives the small DC motor which is used to spin the display PCB, and is passed to the spinning PCB via the slip ring (+5V), and the motor shaft (ground). The spinning circuit board uses a fine metal brush to contact the slip ring, and the +5V is then filtered using C1 and C2 to remove any noise introduced in the transfer.

A PIC 16F84 microprocessor is used to drive 3 banks (red, green and blue) of 8 LEDs in a multiplexed configuration. These LEDs are connected as common anode rather than common cathode for two reasons. Firstly the PIC is able to sink more current than it can source (25mA sink *vs* 20mA source per pin). Secondly, the three transistors Q1, Q2 and Q3 can be used in an emitter follower configuration. If the LEDs were in common cathode configuration then the transistors would need to be connected with a grounded emitter that requires a base drive resistor. So, by going common anode we save three resistors (yes 15 cents!) and some PCB space, which is perhaps more important.

SPIN FX uses a second brush and a contact next to the main slip ring to generate an index pulse as it passes every revolution. This index pulse is used to synchronise the display circuit so that it can create stationary patterns and writing. In effect, it lets the microprocessor know where the spinning display PCB is at any time. The index pulse is filtered by R10 and C5 to remove noise, and goes to the interrupt pin on the PIC.

***It doesn't look nearly as impressive turned off, does it? The big resistor visible here acts only as a counterweight.***



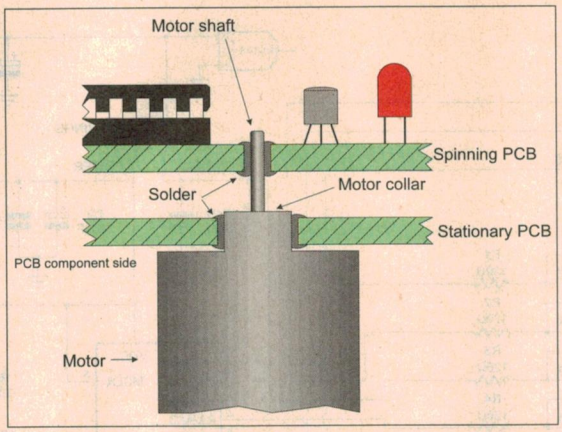
The PIC microprocessor uses an external resistor and capacitor network (R9, C4 and VR1) to generate its instruction clock. VR1 can be used to adjust the clock frequency that has the effect of expanding or shrinking the display. This is necessary to calibrate for varying motor spinning speeds.

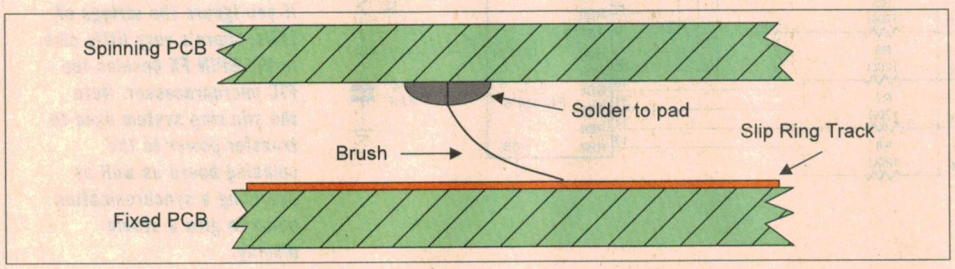
The SPIN FX circuit allows for three banks of LEDs, red, green and blue so that full colour displays can be generated. However most of you would know that blue LEDs aren't exactly cheap, and you would need deep pockets to buy 8 high brightness ones. For this reason, the kit and the demo software use only the red and green LED banks. Provisions for the blue bank have been made so that if you would like to install the extra LEDs and modify the software to drive them you can!

So that's the circuit, it is quite simple because all of the clever stuff is done in the software of the PIC microcontroller. The software operates by read-

ing each element of a pattern from a pre-programmed table and displaying them at exact time intervals. Animations are a little more complicated but are done in basically the same way. I won't go into the inner workings of the software here, but a detailed explanation can be found on the SPIN FX website. The software assembly code and hex programming files can be downloaded from either the SPIN FX or the EA website.

The supplied demo software cycles through an interesting sequence of patterns and animations that should keep you entertained ad infinitum (well, for a long time at least!). If you know how to program a PIC chip then you can try your hand at creating your own patterns. On the website, I have included a base software program that just contains the skeleton framework that you can build on and create your own patterns. The base software is relatively simple, however it can quickly grow in size and complexity when you start doing tricky things like animations as in the demo software. If you come up with some really good ones then feel free to submit them and I'll post them on the SPIN FX website.




## Construction

The PCBs for this circuit are quite compact given the number of components and electrical connections required. Taking look at the PCB artwork you will notice they are double sided boards. It could have been designed as a single sided board, although this would have resulted in its being much larger, and when your talking about fast spinning things, the smaller the better.

If you purchase this kit it will be supplied with quality double sided boards with plated through holes (PTH) to join the top and bottom layers. If you are experienced at making your own PCBs then you can make them from this artwork, although it may be tricky to achieve the fine track widths and you will need to solder some components on both sides of the PCB (unless you can do PTH that is!).

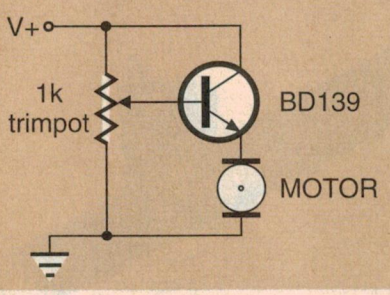
Assembling the circuit is relatively straightforward. Using the component overlay as a guide, solder all the components on to the boards starting with the lowest profile ones (resistors) and working up to the tallest components (capacitors and regulator). There are no wire links required on either of the PCBs. Care should be taken when inserting the LEDs to ensure that they are inserted the right way around and in the correct colour bank positions (L1-L8 green, L9-L16 red). It is quite easy to get carried away and mess it up (I know, I have done so several times!), so be careful.

The LED's cathode (notch or flat side and short leg) goes to the side with a flat line on the silk screen. Be warned that de-soldering components on PTH boards is painfully difficult without expensive de-soldering gizmos so be extra careful to get everything right the first time!

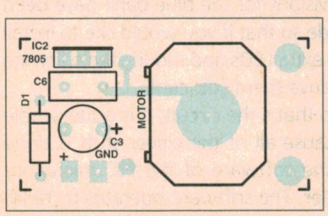
Use the 18-pin socket for the PIC so that it doesn't get damaged while soldering and can be easily removed for reprogramming. Remember that Q3 and L17-L24 should be left off unless you are intending to make a full colour display and modifying the software accordingly.

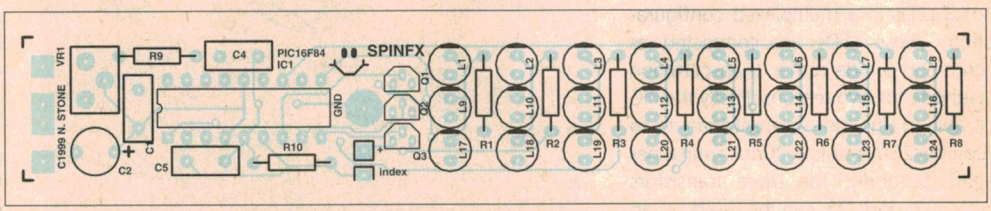
## Motor speed control

A variable speed control for the motor can easily be added, and it will enable you to change the speed at which the SPIN FX spins. This will probably be necessary if you use a motor other than the one suggested, as it may well operate at a different speed. This little circuit uses a variable resistor to set the voltage and a NPN transistor in an emitter follower configuration to drive the motor.

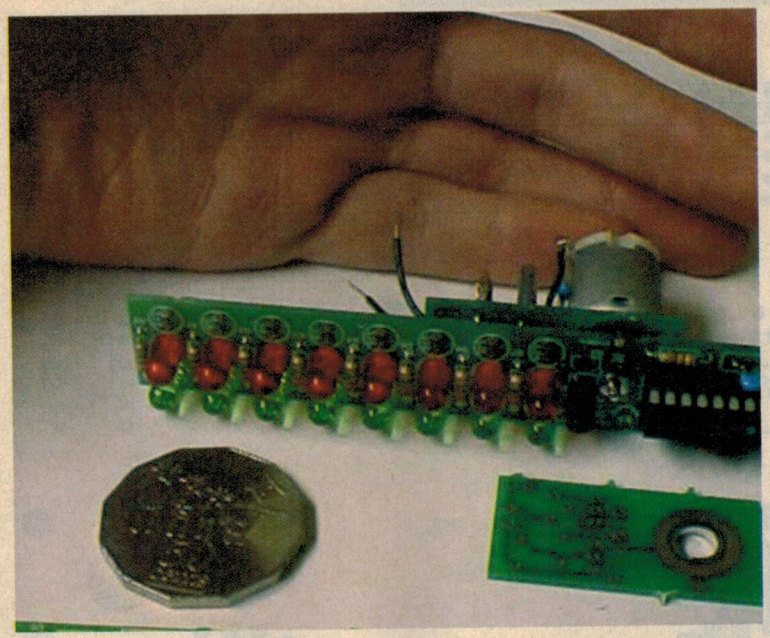



***Only the power supply section mounts on this board, along with the motor, soldered in from the component side of the PCB.***




***The PIC should be mounted in a socket to facilitate easy removal for programming, and note the hole between the PIC and the driver transistors for the motor spindle. Provision is made on the board for a third row of blue LEDs, but you can create some stunning effects with the (much) cheaper red and green ones, and add the blue ones later when finances allow.***



***Small in size, but big on effects, the SPIN FX is quite simple to assemble, thanks mainly to the two double-sided PCBs.***

Once all the components have been installed, set the potentiometer VR1 fully clockwise at its maximum value. This sets the PIC clock to a frequency that is appropriate for most displays.

## Mechanical stuff

Now we've done all the easy electrical assembly its down to the tricky mechanical stuff. Firstly mount the heatsink on the regulator so that it leaves ample room for the motor. It doesn't matter if the heatsink touches the motor as they are both grounded. The motor mounts on the component side of the PCB so that its collar is soldered into the large hole. The motor collar must first however be tinned with solder so as to achieve a good join. To do this use a fine file to clean up the collar all the way, then with a very hot iron apply a thin layer of solder around the collar. (If you can't adjust the temperature of your iron then just be patient as it may take a while to get the solder to stick). Use the file again to remove any excess solder and so that the collar is a snug fit into the hole. With the motor now in place so its tabs face the regulator solder the collar to the pad on the bottom layer. Ensure a good join is achieved otherwise it may all fall to bits! Connect up the motor wires — looking from the front, the motor should rotate clockwise when running. If it doesn't, swap the wires connecting the motor.

Next, we have to balance the spinning PCB, otherwise it wobble all over the place. This is done using that 5 watt resistor you've been wondering about as a counterweight — I guess you could call it a ballast resistor! (Sorry, bad tech joke...)

Bend the resistor's legs so that they'll reach the pads on the microprocessor end of the PCB. The resistor should be soldered so that its innermost edge is about 6mm away from the edge of the PCB.

Place the PCB on the motor shaft and leave loose in a horizontal position to determine if it is balanced. If it tips in either direction then move the 5 watt resistor either closer to or further from the PCB until a reasonable balance is achieved.

Now the slip ring brushes must be installed; these solder to the bottom side of the spinning PCB. Ideally these brushes should be made from some thin brass sheet (shim), although if you can't find any of this then you will need some other kind of springy metal sheet or wire. Cut two rectangular pieces approximately 2 x 6mm, and solder these to the two brush pads on the bottom side of the PCB at right angles to the board. Place the spinning PCB on the motor shaft, and ensure that the brushes contact the power slip ring and index pulse pad. Reposition them as required to make sure that they don't bridge across to any other track on the motor PCB.



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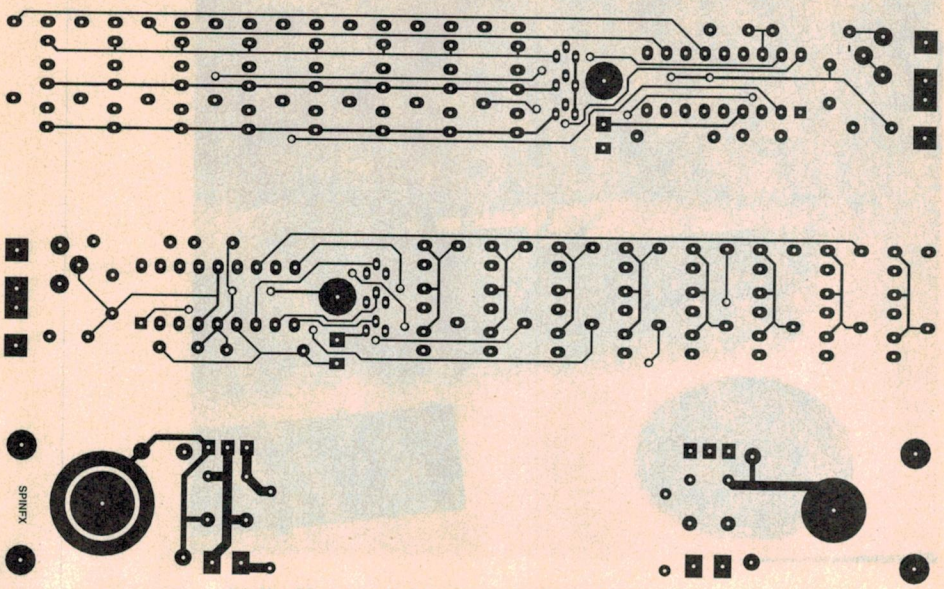
Don't put a permanent bend in the brushes as they will lose their springiness, and check that the end of the brushes don't have any sharp edges, otherwise they can scratch grooves into the slip ring.

Finally, the rotating PCB needs to be mounted on to the motor shaft. Use a fine file to rough up the shaft, as this will help the solder to stick. Insert the shaft into the hole on the rotating PCB far enough so that the brushes contact the slip ring and bend so as to create a smooth connection. Looking from the front, the spinning PCB will rotate clockwise, so ensure that the brushes are bent so that the ends trail rather than push along the slip ring when rotating. When happy with the PCB position on the shaft solder the shaft to the pad on the top (component side) of the PCB. It may take a few tries at the soldering to get the two PCBs parallel, otherwise the display will run crooked on the shaft.

To prolong the life of the brushes and slip rings apply some fine oil or grease to the PCB rings. I used WD40 although it tended to disappear after a while. Whatever you use it will probably need lubricating from time to time.

If the slip rings get significantly worn over a period of use then they can easily be rejuvenated. To do this, desolder the spinning PCB from the motor shaft and clean the slip rings thoroughly. Then apply a thin and even layer of solder all the way around the main ring and on the index pad. Ensure that the applied solder is not lumpy and will not catch the slip rings. Now reassemble and it should be as good as new.




## Mind de fingers!

Congratulations on getting this far, all that mechanical construction bit wasn't easy. All that remains to be done is to mount the device so you can stand back and admire it running. I made a stand out of Perspex to hold the motor although for testing purposes you could just use a small vice. Clamp the motor rather than the stationary PCB as the motor supports the weight of the spinning board. Also, if you only support the board, the solder join on the motor collar may break. Don't forget to allow enough space for the spinning PCB to rotate.

The circuit draws about 350mA, and will run happily from 9-14V (although at higher voltages the regulator will get hot — make sure that if the display is running for a long period of time that the regulator does not overheat).

For the most impressive results, the SPIN FX is best viewed in a dark area looking head on into the LEDs. When the main PCB starts spinning it effectively disappears from view, but be reassured it is still there and it only takes a momentary lapse in concentration and some inquisitive fingers and.... well it bites, you have been warned!

If when you first apply power the board spins but there's no display, check that all components are installed in the correct positions and orientations and both brushes are contacting correctly. If the animation displays grow too large and cause the display to flicker then you will need to increase the PIC clock frequency. This is done by adjusting VR1 in an anti-clockwise direction.

Well that's it, happy spinning!❖

***To be honest, we'd suggest that you but the boards ready-made, as they come with plated-through holes and a silk screened overlay. For the diehards out there, we've reproduced the artwork for the two double-sided circuit boards above. Just make sure you don't flip one of the negatives by mistake...***

## Parts List

**Resistors**
(All 0.25W 5%)

| | |
|---|---|
| R1-R8 | 120 ohms |
| R9 | 3.9k |
| R10 | 3.9k |
| R11 | any value 5 watt ceramic resistor (!) |
| VR1 | 5k |

**Capacitors**

| | |
|---|---|
| C1, C5 | 0.1uF monolithic |
| C2, C3 | 220uF 16VW electrolytic |
| C4 | 82pF ceramic |

**Semiconductors**

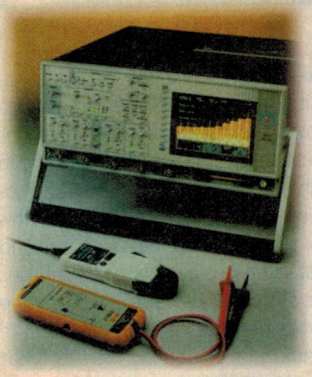
| | |
|---|---|
| D1 | 4004 power diode or equiv. |
| Q1, Q2 | BC548 NPN transistor |
| L1-L8 | High intensity green LEDs |
| L9-L16 | High intensity red LEDs |
| IC1 | PIC16F84 programmed with software spinfx.hex |
| IC2 | 7805 voltage regulator TO220 package |
| Q3 | BC548 (optional) |
| L17-L24 | High intensity blue LEDs (optional) |

**Miscellaneous**

18 pin IC socket; TO220 heatsink; small DC electric motor (DSE P9000, Jaycar YM-2706 or equiv.); thin brass shim for slip ring contacts; SPIN FX motor and display PCBs

Complete kits of all the parts including a pre programmed PIC (no blue LEDs though) are available for $38. Ordering details are on the website.

SPIN FX website :
**www.sautec.com.au/spinfx.htm**



# Hand tools, archaic TVs and, would you believe, musical socks...

Our first contributor this month could almost change his career, to a TV scriptwriter. The intro to his story reads like a dialogue for a segment from one of those Lifestyle programs.

The story comes from Mr D.R. Gott, of Toowoomba in Queensland. We have heard from Mr Gott before with reports on fixing high pressure washers. This time he is 'into' hand tools and passes on some valuable tips about servicing the ubiquitous power drill. Here's his latest contribution.

*Being retired has its advantages; time to fix up my own tools, test equipment, coax our aging XD Falcon to reach its 20th birthday.... you know the sort of thing, I'm sure.* (I do! I do! Particularly that bit about the aging XD Falcon. I delight in keeping my '73 model Datsun 1200 wagon up to scratch! — SM)

*It does have its down side though. Knowing that I have a bit of time on my hands prompts friends, acquaintances, family, et al, to lumber me with the kind of jobs I don't really want. Into that category I would lump power tools per se. Categorically, electric hand tools get horribly abused. I can spot from a mile away the bloke walking down our drive, dangling some bedraggled looking object by its power lead.*

*"Hi Rob," said with a cheery smile. "I wonder if you could just have a look at..?" My glazed eyes behold a two speed 240V hammer drill... Oh no! Quick, what excuses have I? An aged cousin in Tibet needs me to go and chop her a winter supply of firewood; like immediately? Unfortunately 'friend has parked his ute in the drive, blocking my escape route.*

*So I try the coup-de-grace — "Sorry but I'm not a licensed electrician!" "Well, perhaps you could just tell me if it's worth repairing?" Heavens, that's nearly as bad as fixing the rotten thing. "Might only be the lead," he apologizes, indicating where sharp guttering had nearly severed the lead. Noticing how pale I had gone and about to explode, he brightened. "I have a battery drill you can look at. Didn't you tell me last week how you fixed the motor on your Makita? I think mine's the same. Oh and there's a circular saw that..."*

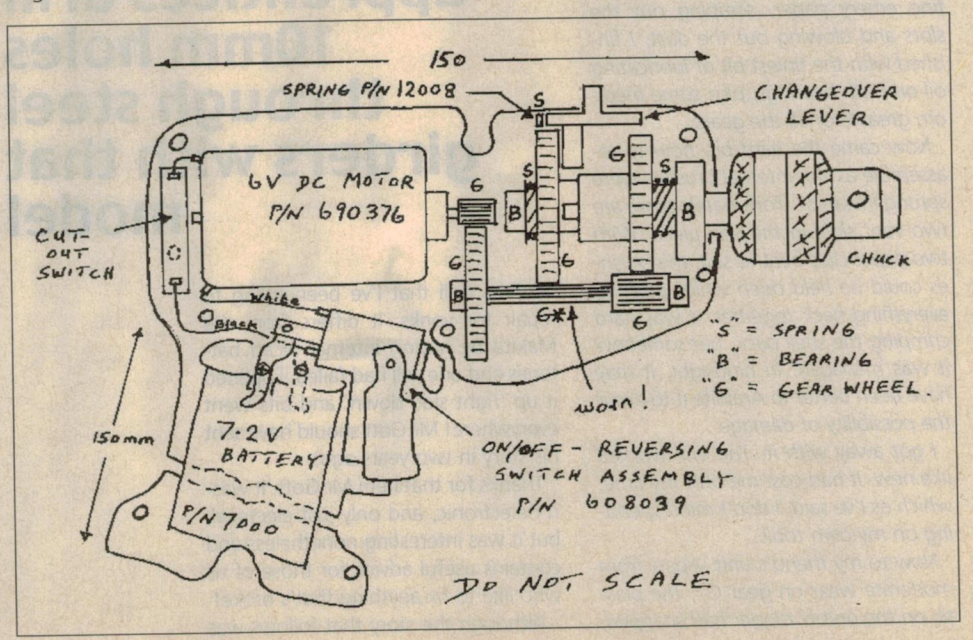
*At that moment he took off back to the ute. It might have just been the incredulous look in my eyes. Then, it dawned on me, I had done it again, crowed about how I had saved myself heaps by fixing my 7.2V Makita 6012D. Yes, this was the same 'friend' that I shot my mouth off to. I could have kicked myself. 'Friend' staggered down the drive with a 20 litre plastic drum. "Do you think you could just check these; just tell me what's wrong - rough idea what it will cost to fix them?"*

*I groaned! One look inside the drum revealed several motley electric tools. "Give you a ring... Next week perhaps?" He hesitated. "I suppose they have had a battering....Better be off then — See you later." I nodded; mute.*

*I won't bore you with the full details; the new lead on the Makita hammer drill with no model plate; a small 240V Makita no plate — write off — armature shot; new brushes, p/n 294408, $15, for a Protool EVP13B-2GB drill; sticking brush in holder, Makita 5900-B-SAW-DIA-9 1/4 circular saw, otherwise OK.*

*Finally, the Makita 6012D, one of the finest 7.2V drills ever made.*

*When I was working at a uranium mine as an instrumentation fitter in 1989, I frequently saw apprentices drill 10 mm holes through steel girders with that model. I bought one when I retired, but after 5 years the motor started labouring, even with a fully charged battery. I'll tell you how I fixed my drill, then how I fixed friend's. Hope it may help you too.*




**An X-ray view of Mr. Gott's Makita 6012D electric drill – one of the finest 7.2V drills ever made, apparently. All it needed was a bit of TLC to bring it back to life.**

## Drill dissection

*Lay the drill on the bench, left side down. Remove the seven Phillips head equal length screws. Now, BEFORE you remove the right hand one piece casing, look at Fig.1. The sketch shows a very small spring p/n 12008 to the left of the changeover lever (high/low speed).*

*Be warned! If you don't remove the right hand side casing carefully, you may loose this indent spring. I did first time! Even worse, if you removed the case screws with the drill vertical, and then tipped it to the right, not only could you loose the indent spring, but all the guts — motor, switch, gears — the lot — would fall out, on the floor perhaps.*

*Am I telling you how to suck eggs? Not really. Many battery drills come apart like this, but so often a manufacturers manual is not obtainable, (how often do we hear that?) and we have to learn the hard way; like me. Sorry, I digress.*

*It's amazing that such a small motor, roughly 35 mm diameter by 60mm long, can pack such a punch. It is a sealed unit, namely no external brush holders. It was either a new motor, (p/n 690376, $45 as I found out later) or butcher open the crimped shell and have a look. This I did in the vice, as carefully as possible, taking care not to crush the shell!*

*The commutator was a mass of black goo - carbon presumably - but the brushes had plenty left. After cleaning the commutator with very fine emery paper, scraping out the slots and blowing out the dust, I finished with the tiniest bit of lubricating oil on both bearings, plus some medium grease for all the gears.*

*Now came the hard bit; how to reassemble as the internal brushes were sprung inwards? Fortunately there are two vent slots in the end piece. With two paper clips bent to suit, the brushes could be held open whilst pushing everything back together. It was hard crimping the shell back, but somehow it was managed. In hindsight, it may have been better to Araldite it to avoid the possibility of damage.*

*I got away with it. The drill worked like new. It had cost me only my time, which as I've said, I don't mind spending on my own tools.*

*Now to my friend's unit. Apart from moderate wear on gear G*, the plastic on the on/off trigger had snapped, and the indent spring was missing, indicating that the case had been previously opened!*

*With gear shaft G* assembly removed, 7.2V DC was applied to the motor, from my bench power supply, one polarity then another and the motor sounded healthy.*

*So all in all, the total bill was $46.50 including a modest $15 for my time. A new switch p/n 608039, $30, new detent spring p/n 12008, $1.50. Our friend's battery was shot; absolutely, but he managed to salvage a reasonable battery from another drill. Otherwise the extra cost for an original Makita battery (p/n 7000) would be $90, or $70 for no name brand.*

*Well, was it all worth it? I'll let you be the judge. A new 7.2V Makita costs $220 recommended retail! At least you now have some idea what is involved in drill repairs.*

*I hope I haven't bored you too much, and with that weak pun, happy drilling! Oh, by the way, do get a licensed electrician to check your 240V work, especially if you are doing a job for others...*

So there you go! That's how to fix an cordless drill. Well, one model of cordless drill. As Mr Gott mentioned, many drills open up the same way and most would respond to the same kind of treatment.

As a matter of interest, I've got a Skil cordless drill that I've been trying to repair for yonks. It differs from the Makita by having internal nicad batteries and one cell had failed. I opened it up 'right side down' and bits went everywhere! Mr Gott should have sent his story in two years ago!

**...I frequently saw apprentices drill 10mm holes through steel girders with that model**

Thanks for that item Mr Gott. It wasn't electronic, and only just electrical, but it was interesting nonetheless and contains useful advice for those of us who like to fix anything that's broke!

Although the story that follows was a recent experience for the contributor, it will be an exercise in nostalgia for many senior technicians. It comes from Logan Squires, of Gawler in South Australia. He gives us no indication of his age or experience, but his story suggests that he is young and just starting out in electronics service.

The story will be familiar to anyone who has been in the industry since the beginning of colour TV. Here is what Logan has to say...

## No-go TV

*Well, I guess it started off when I was at the auction looking for a TV which wouldn't cost me too much. I picked up a 66cm Philips 02KJ656 (K11 chassis) set for $1 which is about as cheap a TV as one can get. It was labelled 'Not Working' so I don't think I paid too much. I rushed it home and sure enough it failed to fire up.*

*As my multimeter doesn't actually measure high voltages (such as 240V mains) I could not quickly diagnose the fault. At first I found one of the main fuses in the power supply had blown. On replacing the fuse the power supply immediately responded by making a ticking sound.*

*At first I decided to check all the componentry in the power supply section. I noticed three plugs were connected to the power supply from two main boards in the TV set. So I decided at first to go about removing each plug, one at a time, in an attempt to find where the fault was.*

*First I set about removing the supply to the audio section, which caused the clicking sound from the speaker to cease. However, the fault was still there, somewhere... But where?*

*So then I removed the supply to the small signal section and the clicking sound ceased. 'Bingo!' I thought. So then I did an ohmic check to see whether there was a short of some description.*

*I checked a number of parts for short circuits such as capacitors, diodes and transistors. No, nothing. So then I plugged the tuner back in and unplugged the deflection board from the power supply.*

*Once again the clicking stopped. I checked the line output transistor (a 2SD350A) and discovered that it had a shorted collector-emitter junction. 'Bingo!' I thought again. I rang up a supplier in Adelaide and ordered in a*

*new part. After about two weeks the new part came in. I immediately installed it, but two things happened. At first the picture seemed to fire up but then it turned off. Well at least I was on the right track. Or was I?*

*I did some more checks on the TV and found a leaky diode, but replacing it didn't seem to fix the problem completely. At least I was getting somewhere, though.*

*I checked parts here and there; capacitors, transistors, resistors and more diodes. Some were leaky, some weren't. I occasionally switched the TV on again, but only to prove I was making no progress.*

## Tripler trouble

*So I decided to visit my local TV technician. He had had some experience with this set and told me to disconnect the wire between the tripler and the flyback transformer.*

*If there was sound then it meant that the tripler was faulty. But if there was still no sound then the flyback transformer was faulty. I knew what he was talking about (or at least I had an idea) and immediately rushed home to try out his ideas.*

*I disconnected the wire, turned on, and sound blared forth from the speaker! I rushed back to the technician and purchased a new tripler. But after installing it, the TV once again refused to work! The ticking was back again.*

*At this point I gave up and it wasn't until some time later that I decided to do some ohmic checks between the flyback transformer and the tripler.*

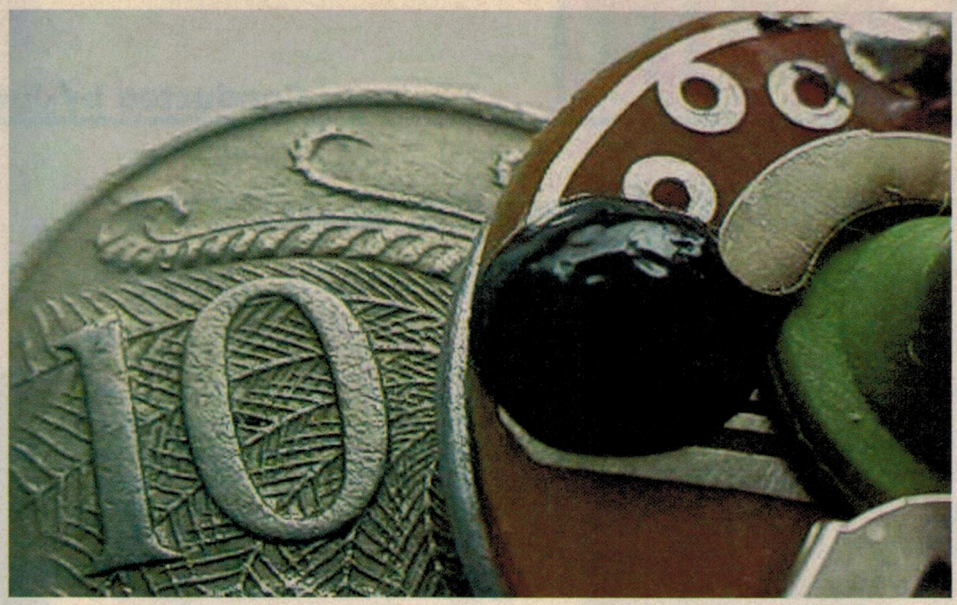
*Studying the circuit diagram suggested that I should read about 860k ohms. After doing this check I discovered to my surprise that there was an almost short circuit. I selected a different range and was able to read approximately 860 ohms! This puzzled me for a while. So I went into Adelaide again and purchased two new 5W resistors valued at 370k and 470k ohms, as close as I was able to get to 860K.*

*I installed the new resistors and I had, not only a picture, but sound too! Some convergence adjustments were made and I had (almost) a first class picture.*

*After all that, I decided to get rid of the set and sold it for the modest sum of $40. That was my first experience at servicing TVs but there is another one on the way, though!*

Do you know, that story is almost identical to the first ever colour TV service story published in these pages something like 25 years ago!

In any event, it closely follows my first experience with CTV back in 1976. It was a Philips K9, not a K11, but everything else about the story was the same. I wonder if it will be repeated in another 20 odd years. Thanks for the story, Logan, and I hope you next repair works out as successfully for you.



***Hmmm, not much chance of a component-level repair here – there aren't any components! Obviously there's a chip under that blob of epoxy, but no one's going in there without a guide...***

## Musical feet

Now for a little story from my own workshop (or more correctly, from my own kitchen - it didn't have to go to the shop!)

In all the years I have been a serviceman, I have been asked to repair some funny things. But nothing beats the job my wife gave me the other day.

She asked me to mend her socks!

She has a pair of those musical socks which play a short tune whenever she presses her ankles together. I know it's a brainless application of clever technology but then, small things amuse small minds. *(Ouch! — Ed)*

One of the socks has a small pocket over the ankle and the active device was sewn into the pocket. It was easy enough to remove what proved to be a small circular pcb, about 20mm in diameter.

The photo shows the general layout. The pcb is the same size as the ceramic buzzer or speaker and the two are cemented together. On the board is a small black blob covering the chip and two tinplate clips that comprise the start switch and also retain the two button cells that drive the thing.

In fact, that's all there is. No resistors, no capacitors, no diodes. Just the chip, a ceramic buzzer and the two cells! The whole assembly was contained in a tough, waterproof plastic pouch. The fact that the sock had been washed dozens of times attests to the efficiency of the packaging.

Before I could do anything, I had to carefully cut away the pouch to expose the pcb. Then I removed and tested each of the two button cells. They produced 1.33V each, against the rated 1.55V so I figured that they were weak, but not yet flat.

I tried to remove the rubber button that covers the switch contacts but this would have required a soldering iron, which wasn't immediately available. So I satisfied myself by cleaning the battery contacts and reinstalling the cells.

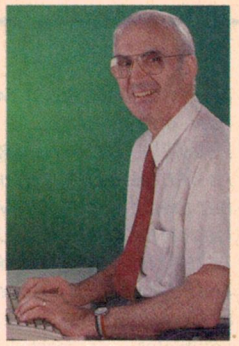
When I pressed the "Go" button, out rang the strains of "Windows of the Mind" and the job was done. With only three volts to operate the device, it wouldn't take much contact resistance to stop it.

All that's left to do now is to devise some way to waterproof the device again. Although come to think of it, it's so easy to remove from the sock that it could almost be left uncovered. I must discuss that with Mrs Serviceman.

And with that amusing aside, we come to the end of this month's column. With any luck I'll be back again next month with more stories from the Serviceman's bench. Keep watching! ❖

# Forum

**Conducted by Jim Rowe**



## SHOULD you be entitled to info for servicing your gear?

*This month we're continuing our discussion of a few months ago regarding the right of consumers and independent servicing firms to obtain servicing information for consumer electronics equipment. One reader seems to be defending the right of manufacturers to restrict this info to their 'authorised agents', while another says the poor manufacturers simply can't afford to provide it to anyone else...*

IN DECEMBER'S COLUMN, you may recall, I presented a couple of letters on a subject that I've had a go at myself from time to time over the years: the difficulty in obtaining circuits and other basic servicing information for quite a few items of consumer electronics equipment, from their manufacturers and/or distributors. One of December's letters came from Peter Churchill, an engineer in Kambah ACT, who had experienced great difficulty even opening the case of a breadmaker he was trying to fix. The local distributor refused to supply any information, saying that it was their international supplier's policy not to provide it.

Well, I've had a couple of emailed responses to this item, which I think you'll find of interest as they present different points of view and also discuss aspects we didn't cover in December.

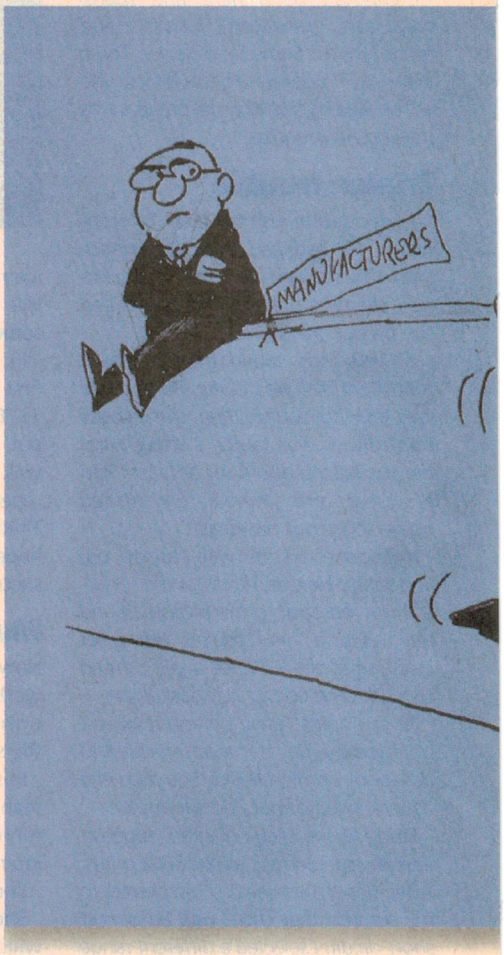
The first response came from Mr Matt Harders, who while agreeing with my proposition that basic servicing should be available, still has 'bones to pick' with both Mr Churchill and myself, as you'll see:

*The issues raised in December's Forum were interesting, however whilst I completely agree that service information should be available to anyone who requests it, I have to disagree with some of the comments made. In particular, Mr Churchill's suggestion that a local supplier claiming that the international supplier will not supply information to a third party is a 'convenient cop-out', and your own 'baulking' at the term Authorised Service Centre.*

*It is obvious that Mr Churchill has never had to deal with many international suppliers, especially non-English speaking ones. Even when an international supplier is willing to give information to a third party, it is often useless because of the language barrier (try doing CD player adjustments via the front panel using instructions written in 'Japanese English'!).*

*If an international supplier refuses to supply information to third parties, they will often use the language barrier to constantly misunderstand your request, until you finally give up. Ask for a schematic and they give you a block diagram or parts list. This way they never have to refuse to supply the information...*

*The fact is that if a global giant doesn't want to supply the information, they won't. Full stop. There is nothing that the local supplier will be able to do about it.*




*Mr Churchill may not realise that there could be a number of reasons that the base of his breadmaker has clips on it, other than just restricting service to authorised agents. Other more logical reasons are ease and cost of manufacture. Clips that are part of the mould cost nothing but the time to design them.*

*Screws cost money for every item produced. When you are mass producing an item, one million screws is profit.*

*There may be safety standards to adhere to in several different markets. Let's face it, if Mr Churchill can't pull it apart then your average Tim The Tool Man Taylor won't be able to either, and I happen to think that is a good thing!*

*I am concerned about your attitude towards authorised service agents. Have a look inside a modern surround sound amplifier and then say that if you owned it you would be willing to let just anyone repair it. An authorised agent usually has several years experience with the brand involved. They get to know common faults. They know the most logical way to dismantle the product. They get to know circuits that that particular manufacturer uses. They have the support of the supplier's service department should they need it. I don't think I need to go on, you get the picture.*

*If you are concerned about service quality, the service department of the supplier knows who their best agents are and if you ask them they will tell you.*

*I must say I was suprised at your comment about authorised agents, especially since you have expressed your concern in previous Forums that there are no young people entering the electronic service profession. An authorised service agent is an excellent place for young people to learn the about electronic servicing.*

*On a different subject, Kevin Attwood claimed in December's Forum that every DVD has the same digital information in it in all regions. If this were so, it wouldn't be necessary to re-master a movie for Region 4 if it has already been mastered for Region 1. They would simply change the 'code' and we would have more titles available here in Australia.*

*He may also be interested to know that the length of the movie may be different not only because of the problem he was complaining about, but also the fact that censorship rules for Region 1 are different to the censorship rules for Region 4. Just look at the fiasco over 'Eyes Wide Shut' — hundreds of edits for the US release, only a few for the Australian release. Of course this should make the PAL version longer, but you can see what would happen if the Australian version had more edits than the US version...*

*I hope that the situation with service information availability does get better, but if we are going to complain about it, let's get the facts straight and complain to the right people.*

Thanks for your comments, Mr Harders. I take your point about local suppliers being quite dependent on the overseas manufacturer/distributor, and your realistic summary that if a 'global giant' doesn't wish to supply servicing information, they won't — and there's really nothing we consumers can do about it, apart from boycotting their products.

Your point about 'other reasons' for using moulded clips to assemble products, rather than screws, is also very valid. Ease and cost of manufacture are of course the prime consideration nowadays, and what we might call 'serviceability' inevitably comes rather lower down the list of priorities. Thanks for reminding us...

I agree about safety considerations, but I'm not sure if I follow what you're driving at with your reference to 'Tim The Tool Man Taylor' and not wanting people like him to be able to open up appliances for servicing. I'm not familiar with that name, but presumably the person you're referring to is a 'handyman' — so are you suggesting that consumers shouldn't have the right to open up their own equipment, even if they're 'handy'?

If that's what you meant, presumably this would be on the basis of protecting them against shock, or causing inadvertent damage to the equipment. But frankly, this seems a pretty flimsy reason for denying consumers even basic information on opening and servicing their equipment. It also seems rather patronising, because it surely assumes that they couldn't possibly have the skill or background to service the equipment, without either damaging it or electrocuting themselves.

With regard to your objection to my baulking at the term 'authorised service agent', perhaps I didn't make clear enough my reasons for this negative attitude.

I'm not against servicing firms specialising in particular brands, and therefore becoming particularly skilled and efficient in servicing those brands and models. Nor am I against young people being trained in such 'specialist' servicing firms. Nor am I in favour of not having any control over the technical credentials of people and firms who 'hang up a shingle' offering to service people's equipment.

What I *am* concerned about is the kind of 'closed shop' situation that can arise with so-called authorised service agents, where customers can end up with no real choice whatever when it comes to getting their equipment fixed in a particular area. They have effectively no option but to take it to the one servicing firm that the manufacturer has appointed — meaning that the firm concerned has an effective monopoly on servicing that brand and its models, in the area concerned. They can't take the equipment to any other servicing firm, regardless of the skills and experience they might have, because all of those other servicing firms are effectively 'locked out'.

Now you may well be right, that this 'exclusive franchise' system ends up with each appointed service agent having a very sound knowledge of the equipment concerned, and also making enough profit to be better able to train young people in servicing. But I have a funny feeling that because it effectively removes competition and creates a type of monopoly, the consumer ends up paying more to get their equipment serviced.

At the very least, their right to freedom of choice in terms of getting their equipment serviced has been effectively removed, in the name of 'improved servicing quality'. I guess that's why I'm a bit lukewarm about the idea

# Forum

— and trying to justify it on the grounds of greater efficiency sounds just a bit reminiscent of the old justification for fascism, on the basis that it 'made the trains run on time'.

## Lack of balance?

Moving on, though, the other response came from Mr Vern Talbot, who apparently runs a firm in Hamilton, New Zealand involved in the broadcasting industry. Mr Talbot is also not happy, regarding what he sees as lack of balance in the December discussion:

*I have long been cautious of 'consumer protection' organisations and media programmes. They always seem to present a very limited and unbalanced view of some individual consumer's woes, without any idea of the overall effect of attending to those woes. With this in mind, I was surprised that you did not add any balance to the views expressed in your recent Forum, about the availability of service information.*

*I hasten to add that I am not a manufacturer, nor want to be an apologist for the industry, but let's step back and consider our collective situation.*

*If a manufacturer makes an item, it will be presented to the consumer along with competing items, and the consumer will make a choice based on facility, perceived quality and price. Of these three, price is likely to be the major competitive decider.*

*Having designed, prototyped and tested the product, a manufacturer then sets about making moulds, buying components, hiring staff, finding factory space etc. At the end of this, the product will have a price at the factory door, which has to include all the manufacturers costs, plus a margin to cover advertising, promotion, warranties and downstream servicing — and finally a profit margin, to make it worth the manufacturer staying in business.*

*In each stage of manufacture, a balance has to be struck on what additional quality or facility can be added, against any consequential increase in final price. The same forces act on the manufacturer's profit margin. Too low and the company goes broke, or goes off and makes something else: too high and the final price is not competitive, the item does not sell, and the company goes broke...*

*It is their perception of the profit margin which seems to give 'consumer rights' organisations their self appointed roles, because this profit margin is the only place where there can be any payment for additional, individual consumer benefits, without those costs being added to the price of the item.*

*Now to downstream servicing. A small part of the purchase price may have included the cost of establishing and maintaining some facility to service the equipment. The cost of this will change from country to country, and really should be a decision made by a regional distributor, rather than the manufacturer, but that's another matter.*

*The goal, surely, is to make available to most consumers the best fit of service system, bearing in mind that any costs reflect on the purchase price. The manufacturer needs to decide where to place this minimum of cost, and it makes sense (to me) that, having set up a system to efficiently satisfy warranty returns, the manufacturer will not spend more on setting up a different system for downstream servicing, even though it is expected that the manufacturer will pay for the warranty repairs, and the consumer will pay for the downstream repairs. It may seem harsh, but if independent service organisations want some of this action, they will need to provide it at a price the consumer is willing to pay, because there is no justification for adding a further margin to the item's purchase price, just to allow the manufacturer to subsidise the independents' inclusion.*

*Should a manufacturer make service information available to every one? I think that depends on the cost. I have always liked to see equipment with circuit diagrams pasted under the top cover. It doesn't cover all the questions, but it does always stay with the equipment, and provides a lot of answers quickly.*

*As your correspondent indicates, being a serviceman is a hard job, with one eye always on the clock and the other on what the client will pay. Most of the servicemen (should that be servicepersons?) I know, are quick, intuitive and rather more clever than I am. But I have seen a few who don't really cut it, and expect the client, manufacturers, Governments, or anyone else to keep them in business.*

*It's a chilling thought that we are moving towards emptying our communities of street-front technologists, people who can contribute much more widely than just in their jobs. But do we want to pay for it? The cost of making service information available is not small, nor is the cost of stocking and retailing large numbers of relatively small cost parts.*

*It makes sense that an item will have an economic life. It breaks my heart to have to bin a favorite piece of ageing equipment when it turns up its toes and refuses to function. I am tempted to repair it, but it is often cheaper to buy a new one. I have to make a decision on this based on quality, facility and price. If the equipment has additional quality or facility, then this will influence my perception of its worth in fixing it.*

*This is an individual decision, made for the end benefit of an individual. I really find it hard to find justify our collectively paying more (in elevated equipment prices) just to satisfy the requirements of a few individuals.*

Thanks for your comments too, Mr Talbot, and I'm grateful to you for redressing what *was* perhaps a lack of balance, by presenting the manufacturer's side of the story. I agree that it is easy for we consumers to overlook the basic economics of manufacturing, and to be unreasonable at times in expecting to receive services at little or no cost to ourselves.

All the same, I don't think it's fair to conclude from this that 'consumer rights' organisations are all motivated by, or see their role purely in terms of reducing or removing the right of manufacturers to make a reasonable profit. Frankly that seems to be tipping the 'balance' too far in the opposite direction...

Surely consumers have a right to representation and fair consideration of their own expectations and 'rights', as one of the key players in commercial transactions like buying electronic equipment. And they probably need this representation, in view of the ongoing trend in consumer electronics towards very large 'global giants' — as Mr Harders calls them — who tend to be very good at enforcing their own rights, and not too interested in those of end consumers. I guess this is another variation on the old 'golden rule': those that have most of the gold tend to want to make the rules.

I confess that your comments about 'downstream servicing' have me a bit puzzled, too. I'm relieved that you don't seem to be against the idea of manufacturers or their distributors having to offer a system for repairing their products within the warranty period, on the basis of this being costed into the original selling price. But why do you seem to be suggesting that a different system has to be set up, at significantly greater cost, for repairs made to the equipment when it's out of warranty? Surely once it's set up, the one system can do both, with the manufacturer simply footing the bills for servicing within the warranty period and the individual customers footing their own bills for out-of-warranty repairs.

In any case, I'm not sure why you've interpreted our discussion about the availability of servicing information and the pros and cons of authorised service agents as some kind of attack on the right of manufacturers to make a profit, or claim that they should somehow subsidise repairs to their products even out of the usual warranty period. Frankly I don't think Peter Churchill had any such proposal, and I certainly didn't.

Your point about the cost of making servicing information available is a valid one, I agree, but my belief is that most people who need, or would like this information wouldn't object to having to pay a reasonable fee for it. This would apply equally whether they're a service technician (independent or 'authorised') or an individual 'technically literate' consumer, capable of carrying out at least basic servicing if this information is available.

Frankly, though, I think cost is just a red herring. The real problem is that a significant number of manufacturers and/or their distributors simply don't wish to provide the information at all, or only to the service agents they've appointed with exclusive franchises in each area. And it's *this* that is wrong, in my

*(Continued on page 91)*

# Opamp Cookbook — 1

**This month, Darren Yates begins a new series looking at some practical opamp circuits, including a couple of the more unusual circuits around.**

## by Darren Yates

Operational Amplifiers, or 'opamps' as they're now more commonly known, are arguably one of the most important circuit components we have available.

And they're also quite versatile.

They make light work of DC signal control and they make even lighter work of amplifying audio signals — you can even use a single operational amplifier chip to make a cheap 50W audio power amplifier. In fact they are so easy to use, few people ever bother to understand even the basics of what's inside them.

You can read tomes of theory behind them but the practical basics of what they do can be best demonstrated by building a crude discrete transistor-based equivalent.

### Opamp No.1

The circuit in Fig.1 is pretty rough and ready but shows the basics of what an opamp is. As you can see, this circuit uses five transistors, a diode and a handful of resistors. The key to the opamp is transistors Q1 and Q2 forming what's called a differential pair.

The base inputs correspond to the non-inverting and inverting inputs of your standard opamp, and keeping it simple, the output of a differential pair is little more than the difference between the two inputs.

Driver transistor Q3 takes this output voltage drive from the collector load resistor of Q1 and controls a resistor/diode string, while transistors Q3 to Q5 form little more than a very basic power amplifier.

The voltage across the diode and 600Ω resistor is set to ensure that 1.2V is dropped across the bases of output driver transistors Q4 and Q5. This forward-biases these devices to remove the crossover distortion.

The 1Ω emitter resistors on Q4 and Q5 ensure that they don't overheat and blow up through an effect called 'thermal runaway'.

Basically, thermal runaway occurs when the transistor's internal emitter impedance drops due to rising temperature. You can hopefully see that if that impedance drops, the current through the transistor increases, which produces more heat, which reduces the impedance further, which produces more current, more heat — until the transistor finally gives up the ghost.

Don't be too concerned — In commercial opamp designs, you shouldn't ever have to worry about this happening.

You can see the theoretical DC voltages on the circuit diagram. If you build it up, you should see similar voltages to these but that will depend on the transistors and the tolerance of the components.

Note too that the circuit is driven by dual supply rails. Obviously, this circuit will also work with a single supply rail but it is generally more convenient to drive opamps with dual supplies. Hopefully, at the end of the day you can see the basics of how an opamp works from this discrete design.

### Amplifier No.1

In fact, it really doesn't take all that much to turn this circuit into a small audio amplifier. I won't promise that the quality will be all that earth-shatteringly good, but it will be at least

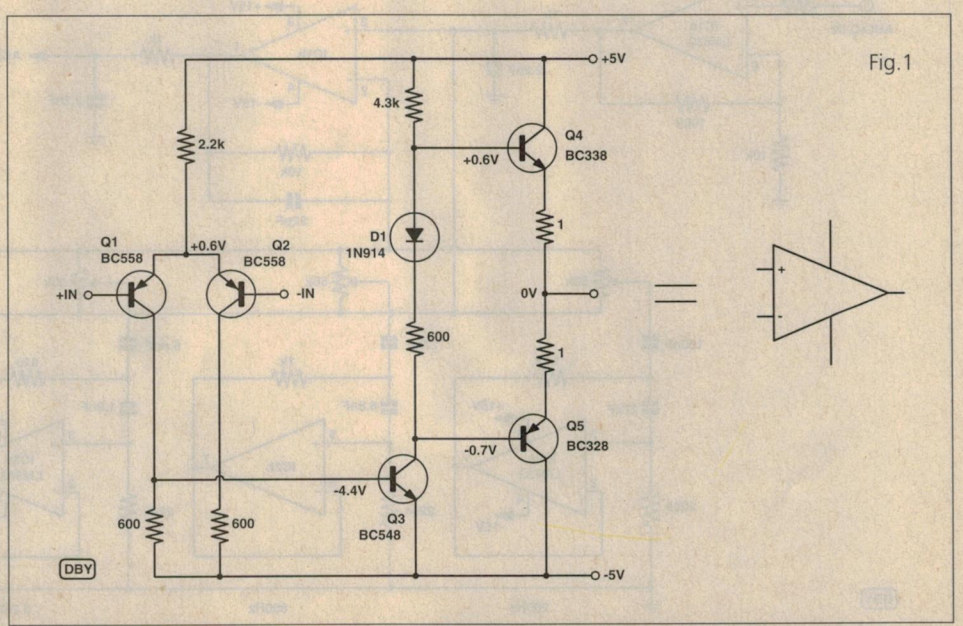
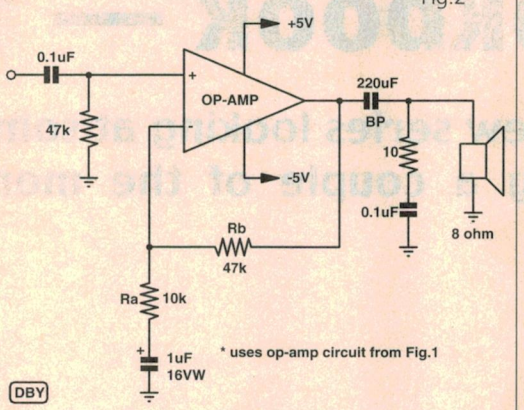



Fig.1

Fig.2




good enough to get the basic point across. To get it happening you only need a handful of passive components.

The new amplifier based on the opamp circuit we described in Fig.1 is shown in Fig.2.

Now I don't recommend you do this with every opamp you come across as most are not designed to drive such a low output load as an 8Ω speaker, but in this transistorised version, you should have little trouble getting it to amplify sound for you.

I'd also suggest you'd have little trouble improving it — the gain in this circuit is set by the ratio of resistor Rb to resistor Ra:

**Gain = 1 + (Rb/Ra)**

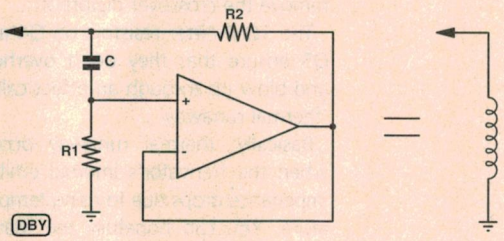
Have a go — build it up and experiment with it. Measure and record the voltages at various parts of the circuit and see how close they are to those indicated. Try changing the supply voltage and some of the resistor values and record your results.

I recently read a biography of Michael Faraday, the son of a blacksmith who later developed the principles behind the transformer, the electric motor and generator. Despite his poor education, he was said to be meticulous in his experiments, recording results and checking them thoroughly, even in his early days when he studied experiments of British chemist, Sir Humphrey Davey. In my book, the more you're prepared to experiment, the better circuit designer you'll become.

It's not impossible to blow this circuit up so use a degree of caution. Make sure you install those 1Ω emitter resistors — they'll go a long way in preventing too many problems.

In the real world, commercial opamps found in ICs are far more complex and quite frankly, far better designed! However, the basic principles are the same.

Fig.3




## The Gyrator

This next circuit in Fig.3 really has no other purpose but to simulate a single-ended inductor, and it uses just two resistors and a capacitor.

It may be simple, but it performs extremely well — at least at audio frequencies.

When you feed an AC voltage through an inductor, the current through that inductor lags the voltage by 90 degrees.

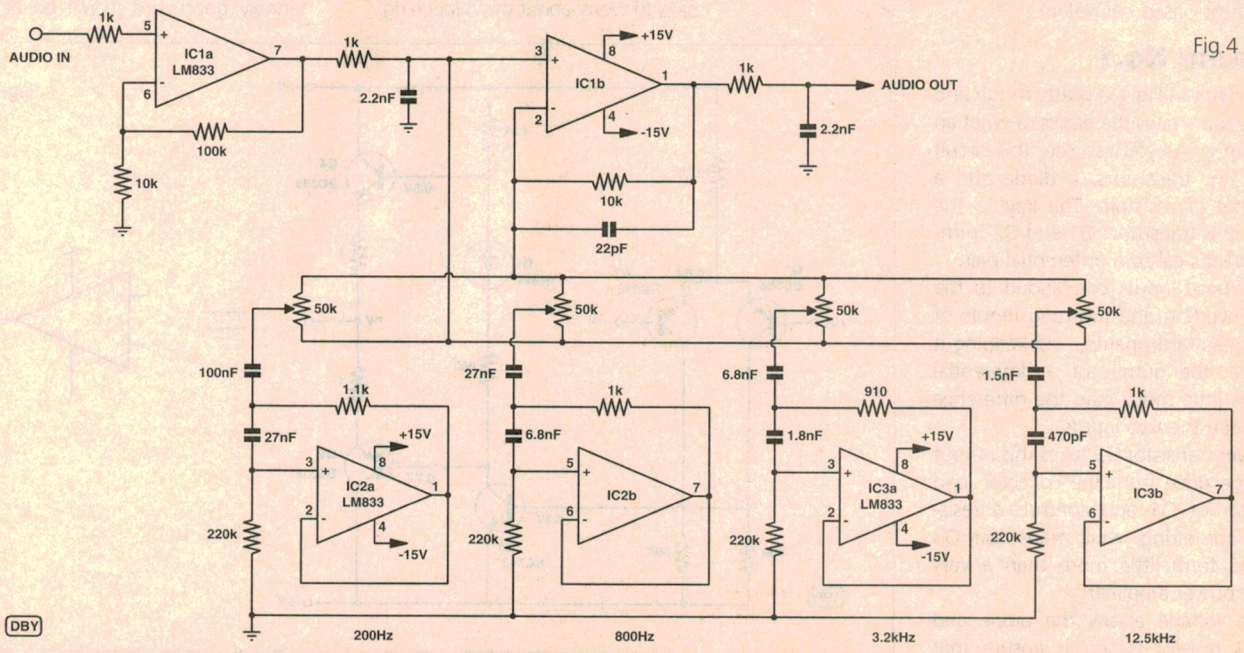
Feed that voltage through a capacitor and the current leads the voltage by 90 degrees.

Inductors are most often used in filter circuits, the tuning circuit of a radio being a great example; however when you start getting down to the comparatively low audio frequencies, the inductors to operate in this range become quite large and expensive.

The gyrator, which effective turns capacitor C into an inductor, is a brilliantly clever and a far cheaper alternative. The value of the inductance in this circuit is:

**L = R1 x R2 x C**

Fig.4



## Graphic equaliser

The most common commercial application of a gyrator is in a graphic equaliser and a basic four-band circuit is shown in Fig.4. The circuit uses six opamps — IC1a as an input buffer, IC1b as a unity gain feedback amplifier while IC2 and IC3 simulate the four inductors.

While we've only shown this circuit as a four-band, you can easily extend this further to make it a 10-band unit by simply adding in extra gyrator circuits.

The way the circuit works is that IC1b is set up as a unity-gain feedback amplifier with four tuned circuits as part of the feedback network. The tuned circuits consist of a single capacitor and a gyrator circuit simulating a series inductor.

The frequency of each tuned filter is:

**F = 1 / 2 x π x (LC)**

At each point, you can boost or cut the frequency set by the LC circuit by about 12dB by varying the associated 50k potentiometer.

Build two of these circuits up and you have a basic, stereo graphic equaliser for your audio system. If the frequencies chosen aren't your cup of tea, just feed in the values into the above equations and work out your own.

## Basic Audio Amplifier

Well, we've already looked at how to build an opamp audio amplifier using transistors, so let's try one using the real thing. The circuit in Fig.5 uses a basic LM741 opamp IC, a couple of transistors and not too much else.

What you will notice is that the bases of transistors Q1 and Q2 have been joined together. Normally, this is a great recipe for creating crossover distortion, but in this circuit the crossover distortion is removed because the transistors are themselves part of the negative feedback loop.

What basically happens is that the crossover voltage is cut down by a factor of the open-loop gain of the opamp, and considering that is in the order of 15,000, there isn't too much crossover distortion left to worry about. Again, it's simple, fairly crude but works like a charm.

If you need an audio amplifier in a hurry, and one that doesn't need too much in the way of grey matter to figure out, this is the perfect one to keep tucked away in your circuit folder. The gain of this amplifier is the same as that in Fig.2, namely: **Gain = 1 + (Rb/Ra)**. In this circuit, the gain is 5.7, and you should by now be able to see the similarities between this and the circuit in Fig.2.

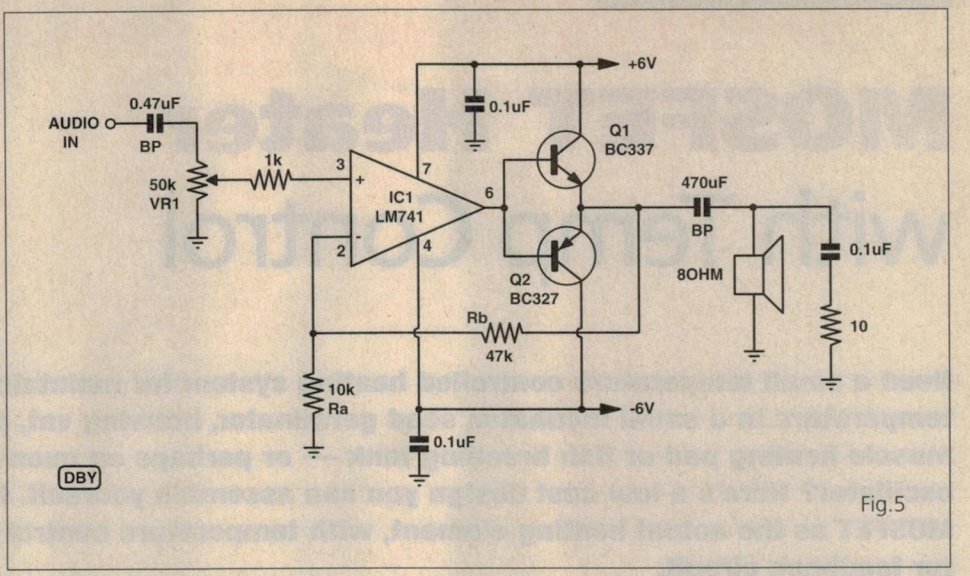



Fig.5

The 0.1uF capacitor and 10Ω resistor form a Zobel network, which reduces the impedance at high frequencies and keeps everything nice and stable.

## Lo-Fi?

The LM741 opamp is not known for its hifi qualities and there are almost any number of opamps you could use in its place — TL071, TL072, TL074, LF351, LF353, LF347, LM833 and LM358 will all do the job, although not necessarily pin-for-pin compatible with the 741. They're not perfect, but they'll do

Well, hopefully, you've gleaned some practical ideas from these circuits. While opamps are generally quite easy to work with and fairly predicable in their behaviour, they are not the answer to every analog design.

For starters, most commercial opamps don't like being fed with much more than about +/18V supply voltage.

If you're looking at designing high-power amplifiers, which require supply voltages in excess of +/-40V, you can see that opamps no longer fit the bill, at least in the output stage anyway.

Another potential drawback is that they also have a fairly limited unity-gain frequency bandwidth. This is the measure of the maximum frequency the opamp can amplify with a closed-loop gain of one.

Most of the more common opamps barely make it above 1MHz although some of the more recent chips such as the LM833 can reach as high as 15MHz.

The way this 'unity gain' figure works is that for the LM833 (as an example), configured with a gain of 1 will allow an AC signal up to 15MHz without serious attenuation.

With the gain set to 2, that drops to 7.5MHz. A gain of 10 sees this fall to 1.5MHz and so on.

Compare that with RF transistors that can reach into the GHz range, and you'll see that opamps are only really used in lower frequency designs. Basically, you won't find many RF opamps lying around.

As we mentioned before, most opamps are also no good for connecting to low-impedance loads such as speakers. If you're keen about audio power opamps that are worth your trouble, check out the specifications for special devices such as the LM1875T 20W and LM3876T 50W audio amplifier chips at **www.national.com**.

Most people who are seriously into hifi often turn their noses up at opamps as being 'not worthy of consideration' — they're the ones who dream of the good old valve days when an amplifier or radio used a 12AX7 on the front-end. Mind you, valve amplifiers are making a big comeback in the music industry where they are the tool of choice for many serious musicians.

Still, opamps are cheap, readily available, easy to work with and operate at fairly low-voltage and current — that's enough for me. Next time, we'll continue with some more opamp circuits.❖

# MOSFET Heater with Temp Control

**Need a small temperature controlled heating system for maintaining the right temperature in a small incubator, seed germinator, brewing vat, pet basket, muscle heating pad or fish breeding tank — or perhaps an oven for a crystal oscillator? Here's a low cost design you can assemble yourself. It uses a power MOSFET as the actual heating element, with temperature control via a thermistor feedback circuit.**

## by Jim Rowe

MOST OF THE TIME, we tend to think of power transistors and MOSFETs as devices whose primary purpose is to amplify and/or control currents. If while doing so they also dissipate power and get hot, that's seen as an unavoidable 'side effect' — which we control by fitting the device with a heatsink to remove the heat and keep it cool.

But power MOSFETs in particular make excellent low voltage heating elements. They're compact and surprisingly rugged (as long as you're careful about static electricity), and are especially easy to control — via their gate electrode. Generally they also have a handy metal tab which is intimately connected to their 'internal heat source', and often this tab has a handy hole for bolting the device to whatever it is that you want heated.

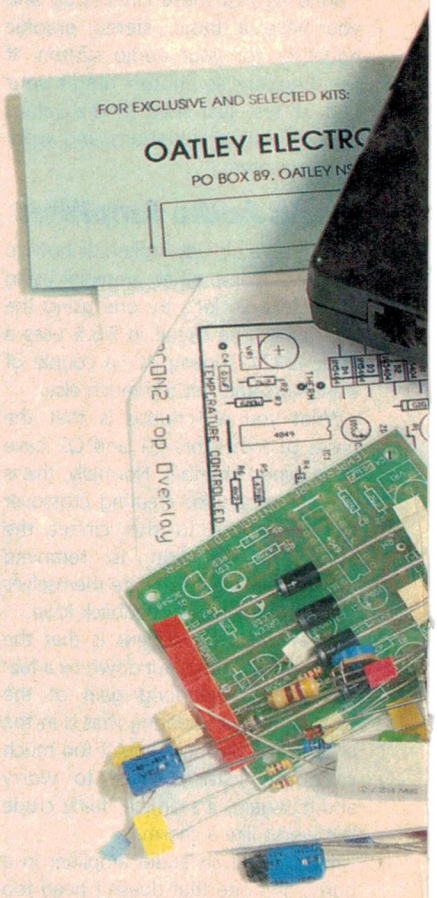
So another very practical use for a power MOSFET is as a heater, especially if you can get them at low cost. Which you often can, nowadays, in surplus equipment...

Of course in many applications for such a low voltage heater, you need to be able to control its heating action in order to maintain a fairly constant temperature. So you need a suitable electronic control circuit which can monitor the temperature of whatever it is you're heating, and control the power fed to the heater so that the temperature is maintained at the desired level.

That's the idea behind this easy to build and low cost project. It's a simple heating control circuit, which runs from either 12V AC or DC and uses a surplus power MOSFET as the heater. A negative temperature coefficient (NTC) thermistor is used to monitor the temperature of whatever you're heating, for feedback control of the temperature — which can be set anywhere between about 20°C and 50°C, a very useful range. And the temperature can be maintained quite closely, to within about +/-0.5° if needed.

The actual heating power can be easily adjusted between about 10 and 33 watts, to make it suitable for a wide range of heating applications: from a tiny 'oven' for a quartz crystal oscillator right up to heating panels for small incubators, fish tanks, brewing vats, pet baskets and seed germinating tubs. You could even use it as an electronically controlled heater for a 'hot water bottle' or heating pad for strained muscles, or perhaps a home-brew waterbed heater.

The design for the project actually comes from the innovative team at Oatley Electronics, who developed it to make use of power MOSFETs from a surplus mystery box which they acquired in large numbers from a distress sale. One or two other parts from the mystery box can also be used in the project, including the 1000uF electro and the plastic box itself (to house the controller board). And the good news is that Oatley is selling a kit for the project, complete with mystery box, for only $17 plus postage.

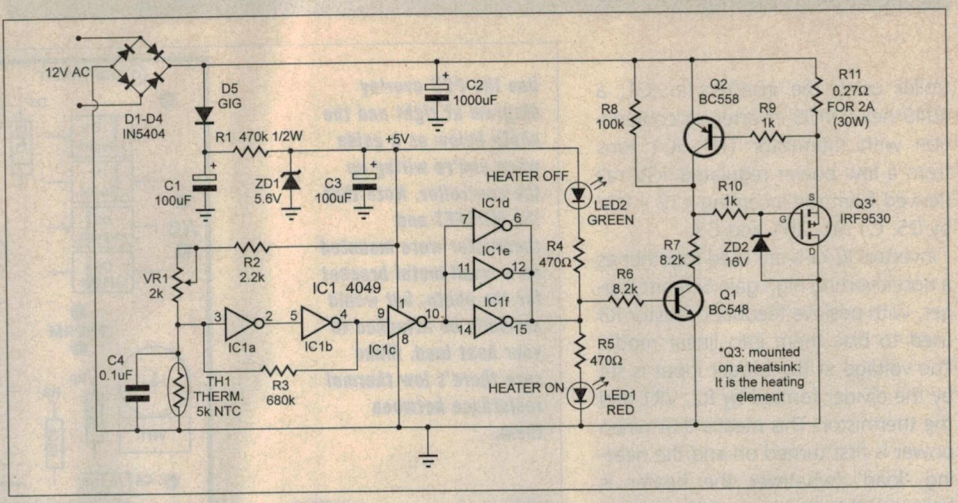



## How it works

As you can see from the schematic, the circuit is quite straightforward and uses only two small bipolar transistors and a CMOS hex inverter IC apart from the power MOSFET 'heater', plus a handful of support components — including TH1, the NTC thermistor used for temperature sensing.

Q3 is the heater MOSFET, which is an IRF9530 or similar (12A/100V 0.3Ω) P-channel enhancement mode device in a TO-220 package. As you can see it's connected directly across a nominal 11

***As you can see, the circuit is quite straightforward. MOSFET Q3 is the actual 'heating element', whose power dissipation is controlled by feedback through thermistor TH1. VR1 sets the heating temperature.***




- 16V DC supply, in series with current sensing resistor R11. The supply is derived via the rectifier bridge formed by 3A diodes D1-4, from either a 12V battery (giving about 11V DC for the heater), or a 12V transformer (giving about 16V for the heater). Capacitor C2 gives smoothing when a transformer is used.

Needless to say if you do use a transformer to power the heater, it will need to have a current/power rating to suit the amount of heating power you need for your application. A 12V/1A (i.e., 12-15VA) transformer would be fine if you only want 10W or so of heating, but you'll need one with a higher rating (say 30VA) if you want to achieve more heating power. The ratings of the IRF9530 MOSFET should allow it to handle up to 50W or so (i.e., 4A at 12V) fairly comfortably, providing you have it closely coupled to the thermistor and heat dispersing metalwork.

Note that if you do want to run the MOSFET at current levels of more than about 2.5A, though, you'll need to replace diodes D1-4 with a 6A or 10A rectifier bridge.

***The prototype heating controller is housed in the compact case from the 'mystery box', but in some applications you might want the controller separate from the heater and sensor, with the indicator LEDs visible.***

The MOSFET is basically turned on and off by transistor Q1, which pulls its gate circuitry down to the negative supply rail via R10 and R7. This applies negative bias to Q3, which therefore turns on (because it's a P-channel MOSFET, shown here 'upside down').

When Q1 is not conducting, Q3's gate is pulled up to the positive rail via R10 and R8 — turning the MOSFET off.

What then is the purpose of transistor Q2? Ah, this operates in conjunction with R9 and sensing resistor R11, to regulate the current that Q3 can draw when it is conducting. In effect, we use these components to turn Q3 into a constant-current load, when it's turned on by Q1.

This works as follows. When Q3 is turned on, it draws current through R11 which produces a corresponding voltage drop. As soon as this voltage drop rises to 0.6V, this provides forward bias for Q2, which begins conducting. And when Q2 conducts it shunts away some of the forward bias on Q3, by voltage divider action with R7. So the current through Q3 and R11 is automatically controlled, to a level where the voltage across R11 is approximately 0.6V.

This provides a very easy way to adjust the MOSFET's heating power level, simply by changing the value of R11. While the value of 0.27Ω shown gives 2.2A (i.e., about 30W of heating from 12V AC), increasing it to 0.39Ω will drop the current to 1.5A (about 23W), while 0.56Ω will drop it to about 1A (about 15W). If you only need about 10W of heating, you can increase R11 to 1.0Ω.

The heating of the MOSFET is controlled by a simple switching-type con-

troller using the inverters in IC1, a 4049 hex CMOS inverter, in conjunction with thermistor TH1. IC1 runs from a low power regulated +5V rail derived from the incoming +12 - 16V by D5, C1, R1, ZD1 and C3.

Inverters IC1a-b are used together as a non-inverting high gain Schmitt trigger, with positive feedback resistor R3 used to bias them into linear mode. The voltage at the trigger input is set by the divider formed by R2, VR1 and the thermistor. This means that when power is first turned on and the heating 'load' (whatever the heater is being used to heat) is at a lower temperature than the correct level, the thermistor will have a fairly high resistance and the voltage at pin 3 of IC1 will also be fairly high. As a result the output of the trigger at pin 4 will switch to the +5V rail.

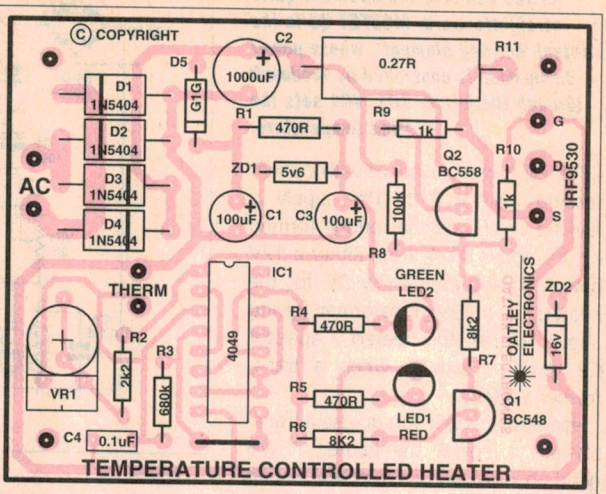
This logic high will be inverted first by IC1c and then again by IC1d-e-f, which are all connected in parallel to give increased current drive capacity. So pins 6, 12 and 15 all go high too, turning on Q1 via bias resistor R6. And when Q1 conducts it in turn switches on Q3, so the heating begins.

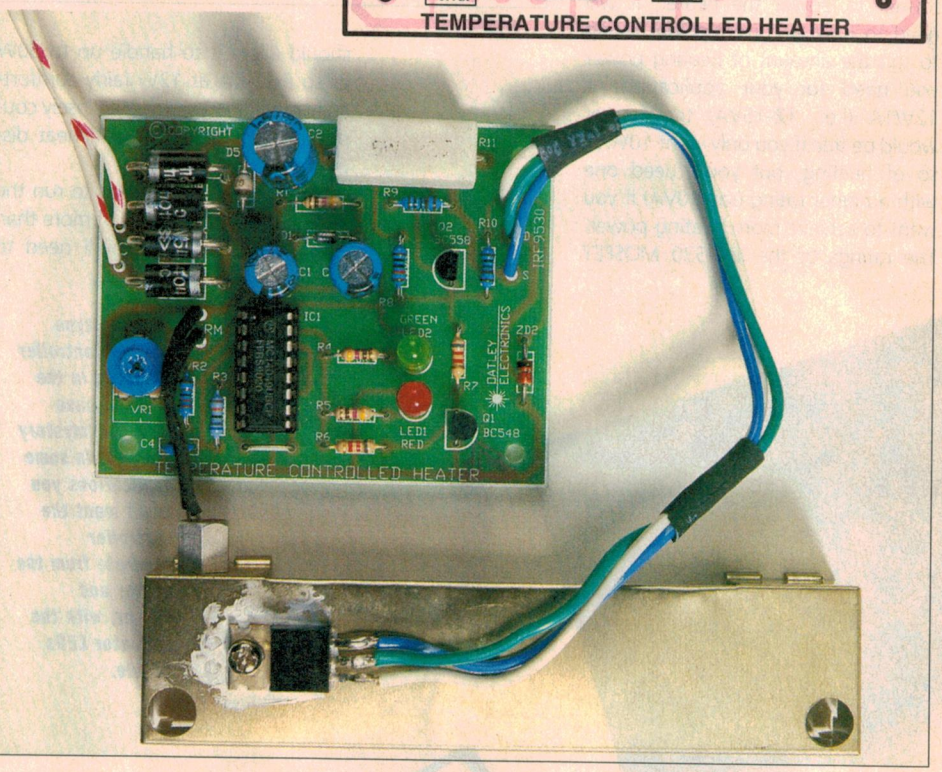
As the load temperature rises, though, the resistance of TH1 will gradually fall due to its NTC characteristic. This causes the voltage at pin 3 of IC1a to fall, and eventually it drops to the Schmitt trigger's switching threshold. When this happens the output of IC1b (pin 4) suddenly switches to 0V, and the voltage at pins 6-12-15 will follow suit. So Q1 and the MOSFET will be turned off, and heating stops — until the load temperature drops again, causing the cycle to repeat itself.

Once the threshold temperature is reached, the circuit tends to switch on and off to maintain it within about half a degree. And as you've probably anticipated, the exact temperature where this occurs can be set by adjusting the value of preset pot RV1. That's because switching of the Schmitt trigger occurs at a particular input voltage level, whereas the resistance of TH1 is inversely proportional to temperature. So by varying RV1, we can set the temperature where the divider produces the critical threshold voltage. With the values of R2 and VR1 shown, you can set the threshold temperature from below 20°C up to about 50°C.

Capacitor C4 stabilises the feedback circuit by slowing it down a little and providing noise filtering. As you can see there are also two LED indicator circuits connected to the outputs of IC1d-e-f, to show the controller's current status. Red LED1 (fed via series resistor R5) glows when the heater is switched on, while green LED2 (fed via R4) glows when it's off.

***Use the PCB overlay diagram at right and the photo below as a guide when you're wiring up the controller. Note that the MOSFET and thermistor were mounted on a small metal bracket for the photo, but would normally be attached to your heat load. Make sure there's low thermal resistance between them.***



## Construction

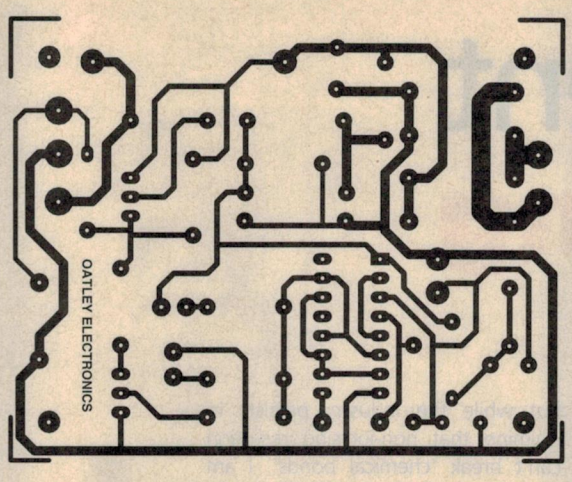
Apart from the power MOSFET 'heater' and the temperature sensing thermistor, and of course your source of 12V DC or AC, all of the other components used in the heating controller can be mounted on a small PC board, measuring 74 x 60mm.

Wiring up this part of the controller should be quite easy if you use the PCB overlay diagram and internal photo as a guide. As usual it's a good idea to fit the low-profile resistors and diodes first — watching the polarity of the latter. I'd suggest you mount the four 3A diodes and current sensing resistor R11 all about 5mm up above the board, to help them dissipate their own heat.

Then you can mount the preset pot and the capacitors, checking the correct polarity for the electrolytics. Note that in the Oatley kit the 1000uF electro C2 is salvaged from the PCB in the 'mystery box', as is the IRF9530 power MOSFET used for Q3 (which doesn't normally mount on the PCB, of course).

Next come transistors Q1 and Q2, plus the 16-pin DIL socket used for

*Here's the artwork for the heating controller PCB, actual size for those who like to etch their own board. Boards will only be available commercially from Oatley Electronics, however, as they own the copyright. (See note in Parts List)*




IC1. Make sure you don't swap Q1 and Q2 (Q1 is the BC548), and that you fit them the correct way around as shown in the PCB overlay.

Finally you can fit LED1 and LED2, although depending on what you're going to be using the controller for, and where you'll be mounting the PCB, you may want to fit these off the board and on a front panel so they're readily visible.

Your board assembly should now be complete, apart from fitting the various leads which will connect it to your source of 12V DC/AC, heater MOSFET Q3, the sensing thermistor and perhaps the LEDs if they're going to be off-board.

## Heater & sensor

Normally the heater MOSFET and the sensing thermistor will be mounted close together on a metal heating plate or bracket of some kind, which may well be some distance (i.e., up to a metre or two) from the controller board. The exact details of this are left up to you, because they depend very much on what you're going to be using the heater for.

The main points to bear in mind are that (a) the metal tab of the MOSFET, which is effectively the source of heat, needs to be in very good thermal contact with the metal plate or bracket that is to convey the heat to your 'load' — i.e., the heating pad, tank, vat, incubator liner, crystal oven case or whatever; and (b) that the thermistor should also be mounted on the same plate or bracket, as close as possible to the MOSFET so that it too is in good thermal contact with it. This is important, because otherwise it won't be able to monitor the temperature properly or quickly enough, and the MOSFET and your load could both be damaged.

So in most cases, both the MOSFET and the thermistor will need to be bolted securely to the same metal plate or bracket, as close as possible to each other and with a smear of thermal compound on the mating metal surfaces to minimise the thermal resistance. And of course the metal plate or bracket must also be in good thermal contact with whatever you want to heat.

Note that the tab of the MOSFET (which is connected to its drain) operates at the negative rail voltage of the heat controller circuit, so it can be bolted directly to earthed metalwork — provided that your 12V power supply isn't separately connected to earth, of course. Normally there won't be any need for electrical isolation between the tab and bracket, then, but you will still need to insulate and protect the three MOSFET connection pins and the leads from the controller soldered to them. Even with the connections shrouded in heatshrink sleeving it still wouldn't be a good idea to submerge the MOSFET in water, either.

Again the thermistor that's provided in the Oatley kit doesn't need any special isolation, because the thermistor itself is 'potted' in and insulated from its bolt-on metal case. All you'll need to do is insulate and protect the two connection wires and their joints with the controller leads.

And that's about all there is to it. When the heater and controller are operating, the red and green LEDs show you their status clearly. Red shows that the heater is on, and green that it's fully off. Note, though, that when the heater has reached your set temperature and the controller is simply maintaining this condition, both LEDs may appear to be on together for brief periods. This is normal and OK.

The only setting up adjustment you'll need to perform is setting preset pot RV1 to give the correct temperature level for the heater and its heating load. For this you'll probably need a thermometer of some kind, or perhaps a thermocouple probe hooked up to your digital multimeter. ❖

## PARTS LIST

**Resistors**

All 0.25W 5% unless specified:

| | |
|---|---|
| R1,4,5 | 470 ohms |
| R2 | 2.2k |
| R3 | 680k |
| R6,7 | 8.2k |
| R8 | 100k |
| R9,10 | 1k |
| R11 | 0.27 ohms 5W (see text) |
| VR1 | 5k linear horizontal trimpot |

**Capacitors**

| | |
|---|---|
| C1,3 | 100uF 16VW RB electro |
| C2 | 1000uF 25VW RB electro (see text) |
| C4 | 0.1uF monolithic or MKT |

**Semiconductors**

| | |
|---|---|
| IC1 | 4049 hex CMOS inverter |
| Q1 | BC548 or similar NPN |
| Q2 | BC558 or similar PNP |
| Q3 | IRF9530 or similar 12A P-channel MOSFET (see text) |
| ZD1 | 5.6V 400mW zener |
| ZD2 | 16V 400mW zener |
| LED1,2 | 5mm LEDs, red and green |
| D1-4 | 1N5404 or similar 3A diode |
| D5 | G1G diode |

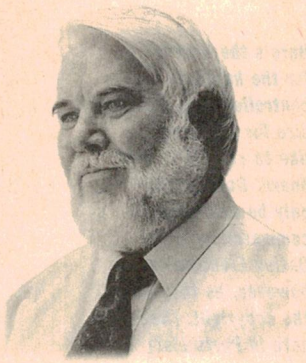
**Miscellaneous**

TH1 5k NTC thermistor

PCB, 74 x 60mm (Oatley Electronics); case and heat dispersal metalwork as desired; connecting wire, solder etc.

**NOTE: Kits for this project are only available from Oatley Electronics, which has copyright on its design. The kit includes the PCB and all on-board components, plus a 'mystery box' which is used to provide capacitor C2, power MOSFET Q3 and the plastic case shown in the photo. It does not include a transformer or battery, however. The complete kit (K-145) is available for only $17, plus $6 for package and postage within Australia. Suitable transformers are also available for an additional $9. To order contact Oatley Electronics at PO Box 89, Oatley NSW 2223; phone (02) 9584 3563 or fax (02) 9584 3561. Orders can also be emailed to sales@oatleyelectronics.com.**

# Covalent bonding



## by Stewart Fist

Occasionally I'm asked to speak at radio-engineering conferences around the world on the subject of cell-phones and health, and usually I face a pretty agnostic, and sometimes down-right hostile, audience.

The prevailing opinion in many radio-engineering circles is that such concerns are the result of irresponsible crisis-mongering by journalists, and ill informed theories of activists who are usually considered to be idiots because they lack even basic understanding of radio theory.

I concede that these two points often carry more weight than I'd like, but this line of attack is actually a version of the ad hominem fallacy: crucify the messenger, rather than deal with the question itself.

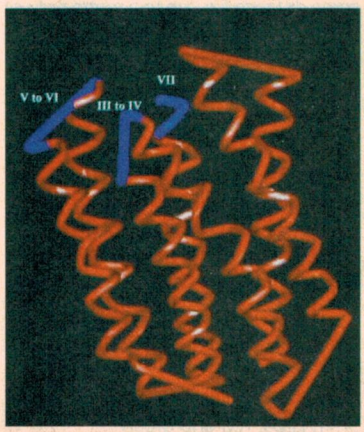
In my opinion, a lack of evidence and fundamental information permeates both sides of this debate, and the one that mainly concerns me with radio engineers is that they persist with the claim that radio waves can't possibly do any harm (unless absorbed enough to produce tissue heating) because photons of non-ionising radiation, by definition, lack the energy to break chemical bonds.

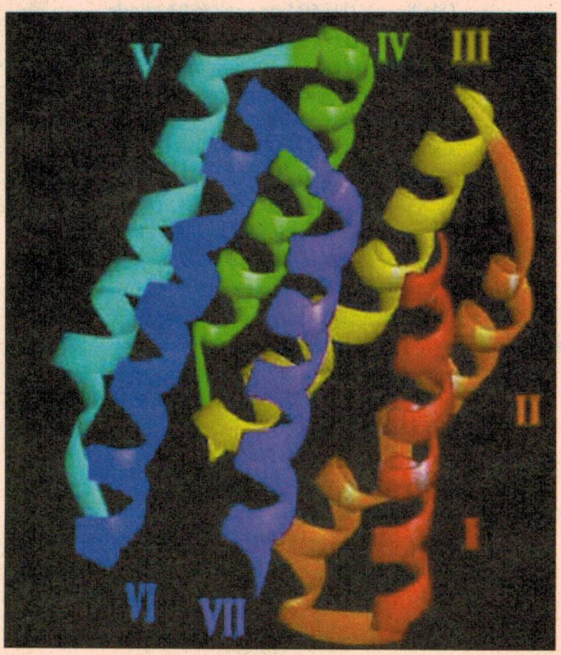
And, unless you can break chemical bonds (so the theory goes), you can't have biological change or damage. At some conferences, I get told this dozens of times a day.

Of course if you are reading this article then you are undergoing complex neurological responses in your eyes and brain which have been triggered by non-ionising light photons, which are creating some sort of profound electro-chemical effect in cells at the back of your eyes. You'd have to be blind to believe that non-ionising radiation can't create biological changes.

Photons of light have much more energy than those of radio, of course, but while the industry persists in claiming that non-ionising radiation can't break 'chemical bonds', I am content to persistently point this highly visible fact out.

Actually I'm also aware that the industry propagandists really mean 'covalent bonds'; there are also ionic bonds and hydrogen bonds under the more general term 'chemical bonds'. But, in fact, none of these claims have much substance.




***Left: The binding site of the chromphore (green) to the opsin protein (pink). Retinal is bound on the Lysine 216 via a Schiff base linkage. Below is a side view of the opsin molecule of rhodopsin, a seven-helix transmembranal protein. Here the seven helices are numbered and highlighted in different colours.***

Ionic bonds are those which break down when solids dissolve in solution even at normal temperatures, so they don't need encouragement from photons of any sort.

Hydrogen bonds are much more fragile than covalent bonds - and we'll discuss this in another article. What the industry doesn't tell us is that the rungs of DNA's 'helical ladder' are held together by hydrogen bonds, while the DNA chains themselves are structured around the much tougher covalent bonds.

So it is true that radio photons don't have the energy to break DNA covalent bonds, but not 'chemical bonds', and not DNA indirectly either. And it's also true that all three types of bond play crucial roles in living organisms.

Even without bond breaking of any kind, there are also other EMF-related considerations in the ways cells survive and work together. For instance, inter- and intra-cellular messaging is conducted mainly by calcium ion (Ca++) flows which are always present in and between cells. And such functions as nerve actions are electro-chemical wave-like processes which don't seem to require bond ruptures. These can then trigger hormone production and lead to cascading biological consequences in different parts of the body.

The point is that, even if it were true that "radio photons lacked the power to break chemical bonds", the only sensible reply would be: "So what?"

But let's just look at the covalent bond claim, since this is the message so often preached, and covalent bonding is very important in biology.

## Covalent bonds

Organic molecules tend to consist mainly of carbon, hydrogen and oxy-

gen atoms in various permutations and combinations. Others play a role to a lesser degree; such elements as nitrogen, calcium and phosphorous.

I don't want to get into a discussion about the modern theories of valency, but basically when molecules have enough electrons in their outer orbit to be saturated (usually eight) they tend to be relatively inert and unreactive.

Our 'noble gases' (argon, neon, xenon, etc) have this outer-shell saturation.

Elements with one or two fewer outer electrons (such as the halides) tend to join forces with elements with one-or-two more electrons (specifically metals) to create molecules which are stable in the dry state. They share electrons in ways that saturate the outer shells of each and make them jointly stable.

However, in solution, they break down into ions once more, where they are surrounded by roughly equal attractive and repulsive forces. The fact that they break spontaneously into their ionic forms in solution, is why electricity can flow easily through such solutions.

Table salt (NaCl or sodium-chloride) is the perfect example because sodium has 1 electron and chlorine has 7 in its outer orbit, and these unstable substances are held together by ionic bonds.

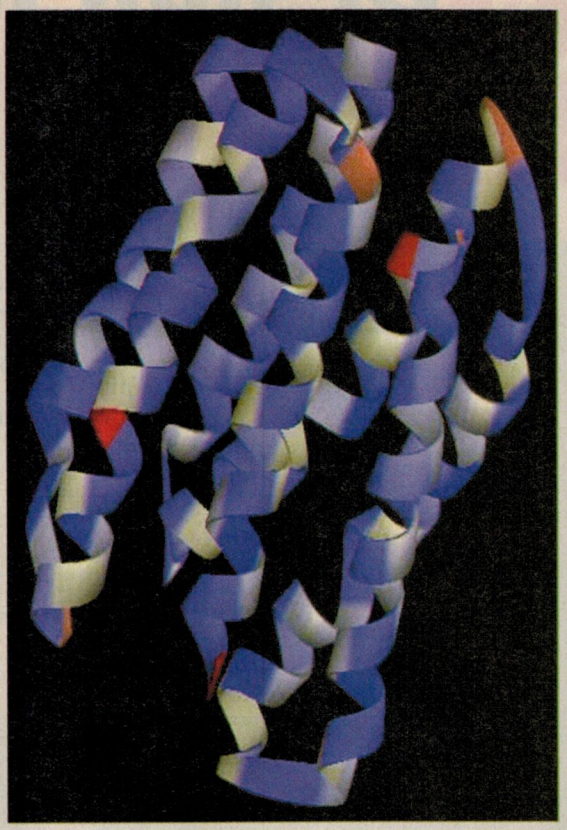
In the middle of the valency range we have elements such as silicon and carbon, each with four outer electrons - half the number needed for saturation. They are therefore balanced between the need to give up four electrons and act like metals, or acquire four electrons and act like the halides.

In fact, they do neither, tending instead to remain in non-ionic relationships with other similar elements, and this is what creates the potential for the strong covalent bonding found in biological molecules, such as proteins (the building blocks of DNA).

Carbon atoms, for instance, can link together by sharing each other's outermost electrons. This distorts the orbits into an elongated figure 8 where the two molecules tend to act as one, and this makes for highly stable combinations.

Covalent bonding also allows oxygen gas to exist in the very stable $O_2$ form, while ozone ($O_3$) with ionic tendencies is highly aggressive. It also explains why $H_2O$ is relatively stable, while $H_2O_2$ (peroxide) is highly aggressive.

When hydrogen, oxygen, and carbon atoms get together, they can combine in an enormous number of ways; creating compounds which often have high stability — but not always. However it is generally accepted that you need photons with the energy of Ultraviolet B or X-rays to break these bonds at normal temperature.



***The opsin molecule is embedded into the plasma membrane of the rod cells, and as a result the molecule is very hydrophobic. The areas containinig hydrophilc residues are protected by other residues around them or occur in the loops which are exposed to water.***

One of the more obvious questions that lecturers in radio engineering seem never to have thought to ask before preaching the doctrine of absolute radio safety, is whether such bonds *need* to be broken for a biological molecule to change in character?

My early medical speciality was eyes, so I'll use vision as my example since I know this area best.

Rod shaped cells in the retina of our eyes allow us to see in the dark. In fact when our eyes are fully dark adapted, we can actually see a single photon. This fact has been confirmed many times and is beyond dispute.

The reactive chemical in each rod is called rhodopsin, and it is a relatively standard long-chain carbon, hydrogen and oxygen-based biological protein, except for one characteristic. It consists of two sub-molecules (opsin and 11-cis retinal chromophore) joined together by a particular type of covalent bond called a "Shiff-base link".

These two parts have a single point of contact which is too strong to be broken by the impact of a photon of light. However, that doesn't mean it can't be twisted (torsion-like) when the chromophore absorbs the photon of light. And that is precisely what happens.

It swaps from the "ground state" called 11-cis to the all-trans state, which changes the way it interacts with the cell wall. This then creates a cascade of change through what are effectively amplifying circuits (retinal cells) which lie behind.

The energy which establishes the ground state is derived ultimately from food and respiration. The photon acts like a trigger, resulting in the mutual orientation of the two molecules rotating 90 degrees, and the cell wall reacts to this by changing its permeability therefore handing the electro-chemical message on. Before that signal reaches the brain it will have been amplified about 1000 times via cascading electro-chemical reactions.

I am not suggesting that identical reactions take place in the brain, glands, or anywhere else in the body due to radio photons, but similar processes can, and possibly do. The point is that photons don't need to carry energy enough to break covalent bonds to disrupt critical functions; molecules don't need to change chemical composition to modify how the body functions. They may just change shape.

Let me give you are more dramatic example of how important molecular shape is.

Hormone (or endocrine) disrupters are industrially-produce molecules which leach out of such things as plastic bottles and are sometimes formed from the breakdown of pesticides. They act on humans and animals as if they are hormones.

Researchers now accept that the constant presence of minute quantities of these molecules in our food and air causes long-term health problems and such things as premature puberty in children. But there is no suggestion that the hormone molecule or its artificial mimic are chemically identical, just that they are the same shape.

So the next time someone insists that radio photons can't cause biological problems because they are non-ionic, just laugh politely and pat his dog.

*If you want to understand more about the complexity of such proteins as rhodopsin, have a look at* ***http://jsdnt.claremont.edu/biochem98/rhodopsin/rhodopsin.htm.***❖

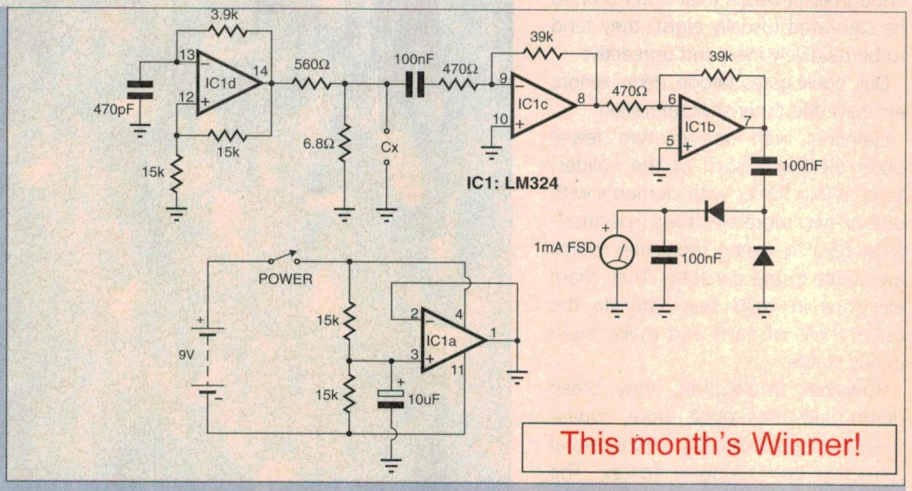
# Circuit & Design Ideas

**Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.**

## Simple ESR tester

Service technicians are very aware these days of the problems that excessive Effective Series Resistance (ESR) in electrolytic capacitors can cause in electronic equipment. An electrolytic can test just fine on a capacitance meter, but still have a higher that normal ESR. This will cause it to be ineffective at coupling or bypassing high frequency signals.

I developed this simple ESR tester, which has been very effective in identifying high values of ESR in faulty capacitors. The tester works by applying a high frequency signal across the capacitor under test (Cx). This signal is amplified, rectified and drives a meter movement to full scale deflection (FSD) with no test capacitor in circuit. If the capacitor's ESR if low, the meter reading drops to zero, with intermediate values of ESR producing a proportion of FSD. Thus the tester does not measure absolute values of ESR, but with experience, you can easily identify a faulty capacitor.




The circuit uses 1/4 of an LM324 (IC1d) to generate a 100kHz signal. The output of the oscillator is attenuated via a voltage divider and applied across the test capacitor. Two further stages of amplification (IC1b and IC1c) increase this test signal and drive the 1mA FSD meter via a voltage-doubling rectifier. IC1a generates a ground reference voltage at half of the supply rail (nominally 9V), as set by the 15k/15k voltage divider. As the test signal applied to the capacitor under test is low in amplitude (approx 20mV p-p) the tester can be used in circuit, without the risk forward biasing any semiconductors.

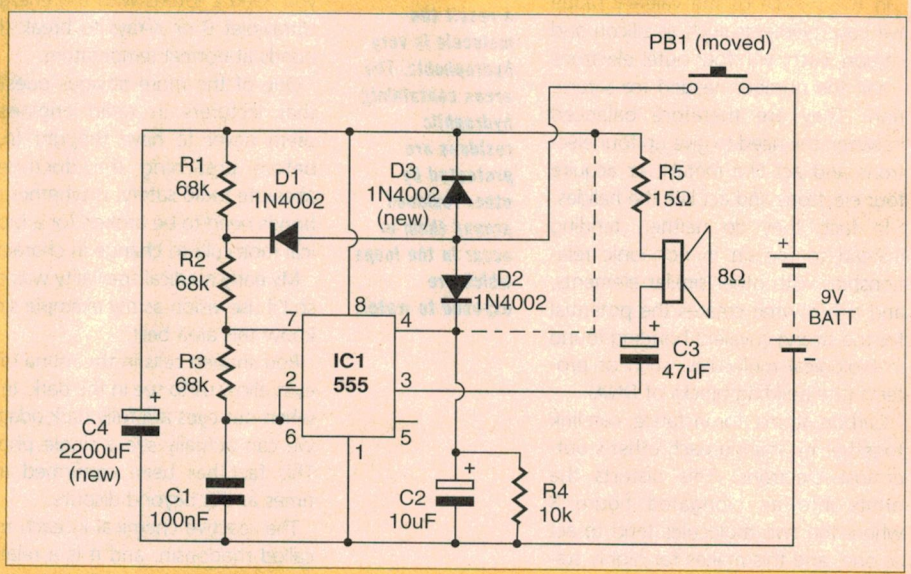
Grant Wills
Gosford, NSW **$30**

## Funway doorbell mod

Here is an inexpensive and easy modification to make the Dick Smith Funway doorbell circuit shut down when it's not sounding, so it can be successfully powered from a battery. It requires only two extra components (D3 and C4), and no major modifications to the supplied PCB.

When the button is pressed, power is applied to the circuit via D3, which causes C4 to rapidly charge. Also, D1 effectively bypasses R1 (causing the higher tone), and D2 quickly charges C2 (enabling IC1). When the button is released, C4 continues to supply power to the circuit but all diodes are now reverse-biased - R1 is therefore no longer bypassed (low tone), and C2 is free to discharge via R4. The low tone then continues to sound until the falling voltage on C2 (pin 4 of IC1) disables the 555, and/or C4 has discharged. The circuit therefore only consumes power when the doorbell button (PB1) is pressed.

The new diode (D3) can be placed on the PCB where the push-button would have been connected, and the new capacitor (C4) can be fitted where the power would have been connected. The negative battery wire can be left where it is, and the positive battery wire




from PB1 can be connected at the anodes of the three diodes.

An additional modification can be made to make the second tone resonate then die away, rather than stop suddenly. This is achieved by removing D2, C2 and R4, (which normally cuts off the second tone), and attaching a wire link from the positive rail to pin 4 on IC1 (represented by the dashed line on the circuit). Now when the push button is released, as the voltage supplied by C4 drops, the volume of the second tone dies away until the minimum supply voltage of the IC is reached.

Li-Wen Yip
South Mission Beach, QLD **$25**

## WIN OUR 'IDEA OF THE MONTH' PRIZE!

**As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is a Video Inspection Capture System from Allthings Sales & Services, which consists of a colour CCD camera, close-up lens set, adjustable stand and lamp, PCI video capture card and software, plus video cable and two plugpacks. You can find out more about this great system at the Allthings website; www.allthings.com.au.**

***Valued at $469!***

**Win our 'IDEA OF THE MONTH' Prize!**

## Linux/PERL sprinkler system!

It's been some years since EA published the Improved Serial I/O interface for PCs - in fact it was way back in 1991!

I've been using my interface to reliably, and successfully control a garden sprinkler system for some years. The system is powered by an ageing computer running DOS and a home brew QBASIC program.

Recently, with positive Linux experiences, I decided it was time for a revamp of the operating program. Linux is an obvious solution for this; it will run happily on a 386, has legendary rock solid stability with uptimes measured in months, and has the system job scheduler 'vixie-cron'. With 'cron you can run programs at specified times, up to a year in advance if you wish, which is ideal for a sprinkler system. If you network the system to your home PC, you can even log the results and have 'cron send a reporting mail to you.

I chose to use PERL language to operate the interface. PERL is included with most Linux distributions, or is available as a free download. It's a curiously flexible language, with it's 'there's more than one way to do it' attitude to programming. Translating the original serial port commands to Linux and PERL was a bit of a challenge, but with some experimentation I was successful.

For other experimenters out there who want to have a hack, the essential command sequences in PERL script are reproduced below. This isn't a complete working program, but just the bare bones outline to show the how commands can be made to work. The lines beginning with hash (#) are comments to describe the script.

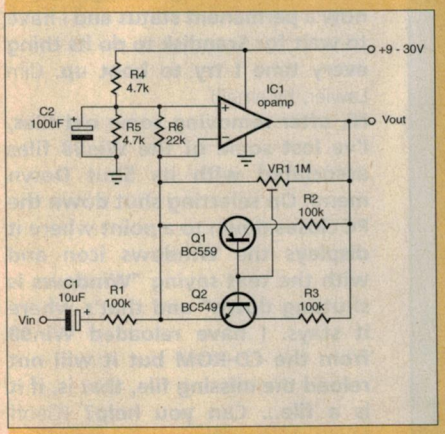
```
#!/usr/bin/perl
# the line above is not actually a
comment it tells the
# system to use perl
#
use FileHandle;
# provides the autoflush routine
system(stty 300 -parenb cs8 -cstopb -
crtscts </dev/ttyS0");
# this sets the correct port parame-
ters
# this example uses 300 baud and
ttyS0(com1 in dos)
open(LINE, > dev/ttyS0") or die
Unable to open serial port for out-
put;
LINE->autoflush(1);
# routine to regularly flush the out-
put buffer
#  Turning on a line
printf LINE
chr($A+(8*$B)+(16*$C)+128);
# As for the original article, $A =
output line;
# $B = data on/off; $C = interface to
be addressed
# Turning off a line
printf LINE chr($A+(8*$B)+(16*$C));
close LINE;
# Input line status check
open(LINE, +< /dev/ttyS0") or die
Unable to open serial port for
input/output;
LINE->autoflush(1);
printf LINE chr(16*$C);
# send input command to interface
number $C
read LINE,$IN,1,0;
# read status from unit (to scalar
$IN read 1 byte
# from offset 0)
close LINE;
$STATUS=ord($IN);
# convert to decimal number repre-
senting the input state.
```

*Author unknown*
*(please contact EA!)* **$30.** ❖

## Soft limiter

### *-ideas for experimenter*

One of the fundamental differences between valve and transistor amplifiers is their behaviour when driven into clipping. Valve amps go into so-called 'soft' clipping, whilst their transistorised counterparts generate large quantities of harmonic distortion. The circuit shown simulates the soft clipping of valve amplifiers, and is intended to be used between the power amplifier's input and the preamplifier's output.



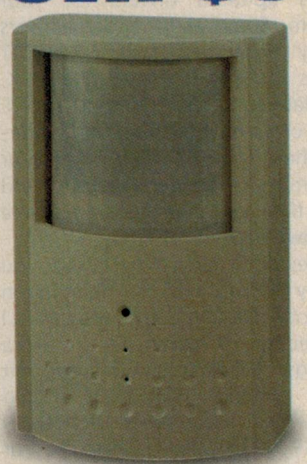

Resistors R4 and R5, decoupled by C2, set a half-supply reference for the non-inverting input of the opamp. Input signals are fed into the inverting input via the DC blocking capacitor and R1 - the latter defining small the circuit's signal gain and input impedance.

For small signals, the amplifier's output is an fixed-gain copy of the input. As the signal level increases however, the time will come when the voltage across the output and wiper of VR1 will be sufficient to bias Q1 or Q2 on. When this occurs, the opamp's feedback increases due to the shunting effect of R2 and R3.

The net effect is that musical peaks above a certain threshold are reduced in amplitude to prevent the power amplifier going into hard clipping. As a result, distortion is noticeably decreased whilst the subjective loudness appears unaffected.

The circuit is adjustable in operation between 130mV and 10V RMS input sensitivity by means of VR1. To set the circuit up, simply set the pot's wiper so that it is shorted to the output of the opamp. Play some music at high volume through the system, and adjust the pot until the audible harshness just disappears.


**from $94**



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# Computer Clinic

## Super fast modems, Shutdown Silliness, more Windows password woes, and a bit of a dig at Microsoft...

### Port vs connect speeds

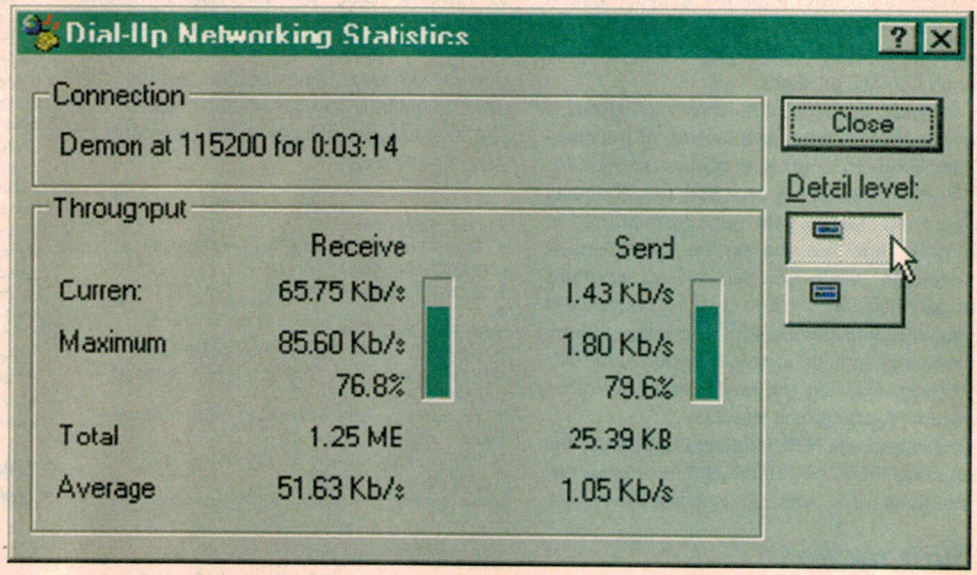
**I am running Win95 with IE5 and Outlook Express 5 with a 33.6K modem. My query relates to the indicated 'connect' speed. I have set the speed to 115,200Kbs and I understand this to be the computer to modem transfer speed, the modem to ISP connect speed being something different. However I constantly see the connect speed displayed as 115,200Kbs which of course is nonsense.**

**Nothing I can do will make the computer show the actual connect speed of, say, 28800. I am fairly certain I have read something on this recently but for the life of me cannot where or what I read. Can you help please?** (Noel Davies, by email)

OK, the first thing you should look for is updated drivers for your modem. Some early modem drivers simply don't interpret CONNECT strings for speeds higher than 28K, and default to the COM port speed. Some other drivers simply don't interpret these strings at all... Go to your modem manufacturer's website, and see if they have later drivers available for download.

If they don't, or it doesn't help, you can try fiddling with the init string in Control panel I Modems I Properties I Connection I Advanced -> Extra Settings. Theoretically, if your init string contains AT&F1, it should report the correct speed. If not, try W2, S95=0 or S95=1. These may or may not work for your modem, but it's worth a go.

If all else fails, go to **www.south-down.co.uk/users/jgrieve/dunmon.htm** and get the Dial-up Networking Monitor. It's small, it's free, and while it can't ferret out your actual connect speed any better than DUN itself can, it can show you lots of interesting statistics on just how much data is actually flowing — which is what's important, in the long run.

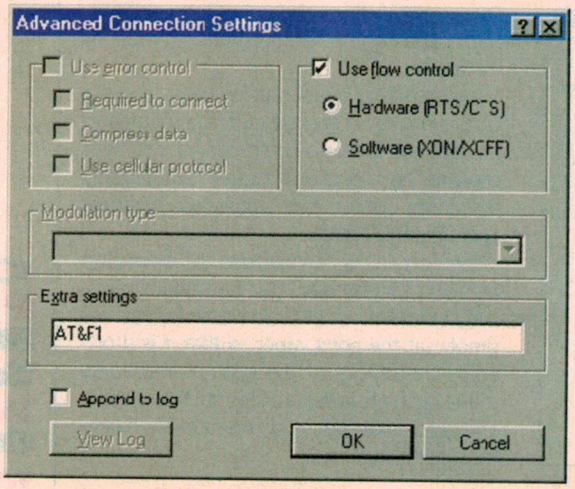



***Dial-Up Networking Monitor isn't going to perform miracles, but it does give you lots of statistics on what's actually going through that phone line.***

### Shutdown Silliness

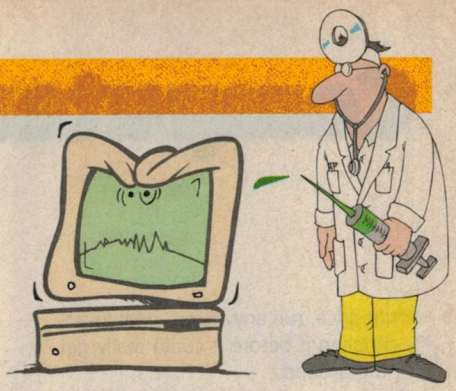
**My 'other' computer, the one with Win95 on it, is not often used but today it began playing up. When I click on 'Shut Down', the usual "Please Wait while Windows shuts down your computer" message appears. Yesterday this was followed by 'It is now safe to switch off your computer' but today the machine is hanging on the first message. I waited 45 minutes but did not get the second message so I switched off.**

**Of course, next time I booted the beast it insisted that I run Scandisk but found nothing wrong. This is now a permanent status and I have to wait for Scandisk to do its thing every time I try to boot up.** (Jim Lawler, by email)




**Hi, after removing some old files, I've lost some of the Win98 files associated with its Shut Down menu. On selecting shut down the PC closes down to a point where it displays the Windows icon and with the text saying "Windows is shutting down" and that's where it stays. I have reloaded Win98 from the CD-ROM but it will not reload the missing file, that is, if it is a file... Can you help?** (Geoff Mullin, by email)

# by Jean-Baptiste Cattley



***Got any computer queries? Whatever is bugging you, from hardware problems to C programming, send it in and we'll soon have you fixed up. You can email your question to electaus@fpc.com.au, or fax or mail it in to us here at EA.***

Sad, isn't it? Here you have a machine that can churn out more calculations in a few minutes than were ever performed by hand in the history of the human race, but because it's running a Microsoft operating system, it's dumbed down to the point where it can't even turn itself off.

Due to the err, wonderful shutdown process, if a driver fails to unload itself properly, or a service crashes on exit, the whole system hangs. There are literally dozens of common causes for shutdown failure, from IRQ clashes to a corrupted shutdown .WAV file (!). I'd go through them all here but MS has beaten me to it, with some rather detailed troubleshooting guides. Check these out:

How to Troubleshoot Windows 95 Shutdown Problems: **http://support.microsoft.com/support/kb/articles/q145/9/26.asp**

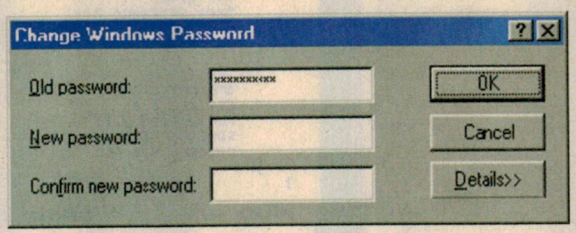
How to Troubleshoot Windows 98 Second Edition Shutdown Problems: **http://support.microsoft.com/support/kb/articles/q238/0/96.asp**

Good luck!

## Pass, friend

**Tom Moffat wrote about security once and gave a web address to check out ones own security. This I did and found that my BIOS were wide open but all else OK. However since then halfway during booting (just as the desktop opens) a box appears asking for my password, to which I press cancel and on it goes. This is a terrible nuisance and I can't get rid of this box. Must be something in the registry. Can you help?** (Andy Gomsi, by email)

Yep... To kill the logon password, right-click Network Neighbourhood, click Properties, and select Windows Logon from the Primary Network Logon box. Next, go to Control Panel




***Password begone! Tell it that you don't want one for long enough, and Windows should eventually get the idea...***

I Passwords, select Change Windows Password, and set a blank password. If you can't remember your old password, delete C:\WINDOWS\<your username>.PWL, and log off. When you log on again, just hit OK to leave your password blank. Windows should get the hint, and not bug you any more about it.

## MSMoney

**In the Jan 2000 edition of Computer Clinic, you said "Be warned, though, that the hardware requirements for Win2K are pretty stiff, and it's not going to be cheap, either." What CRAP! Where did you hear this from? Direct from Microsoft's website (www.microsoft.com/windows2000/news/external/GigaPricing.asp): Windows 2000 Professional pricing remains the same as the current NTW 4.0 prices. Windows 2000 Server price tags will increase $100 over present NT Server 4.0 prices...**

Ah. A slight confusion of terms, it would seem. You consider $485 for one desktop license 'cheap'?

**...I worked for Microsoft in Australia for about 12 months (I left only abut four months ago) and in my time there I saw LOTS of incorrect and damaging articles in many places.. People really have a negative view of Microsoft even though they give the user much more than the average company, e.g. free stuff like IE5, Outlook Express 5 (I think the best email and news package out there), and all the other stuff like Netmeeting (again, I think the best, and its FREE). They also pioneer new technology a lot faster than most other companies, e.g. stuff like windows update... Few programs had this type of "Automatic check for new features/updates" function until Microsoft introduced it with Media player and Windows 98. Now every damn program has it! (the above may not be the best example but there are others.)** (David Ferguson, by email)

Heh. Never let it be said that I don't appreciate the things that MS have done for the PC industry. If it weren't for Microsoft, I doubt that PCs would be a quarter as widespread as they are today. They really have done a great job in making consistently professional, high-quality software... it's just that the poor beleaguered users do have to put up with an awful lot.

What other OS forces a reboot just to install a mouse driver? Why is it necessary to reinstall all the networking files just to change your hostname? Why aren't there any decent command-line tools? Why should a scratched/warped CD render the whole system unresponsive? Why should one application be able to take the whole machine down? Why can't we easily choose the web browser we want? Has anyone managed to place graphics exactly where they wanted them in a Word document?

It's these sorts of questions that lead people to wonder if they wouldn't be better off with a pencil and paper instead. As for pioneering new technologies... Remember Java? MS saw Java as a threat, and did their very best to squash it before it could take hold. Luckily, they didn't manage to kill it, but they certainly undermined the

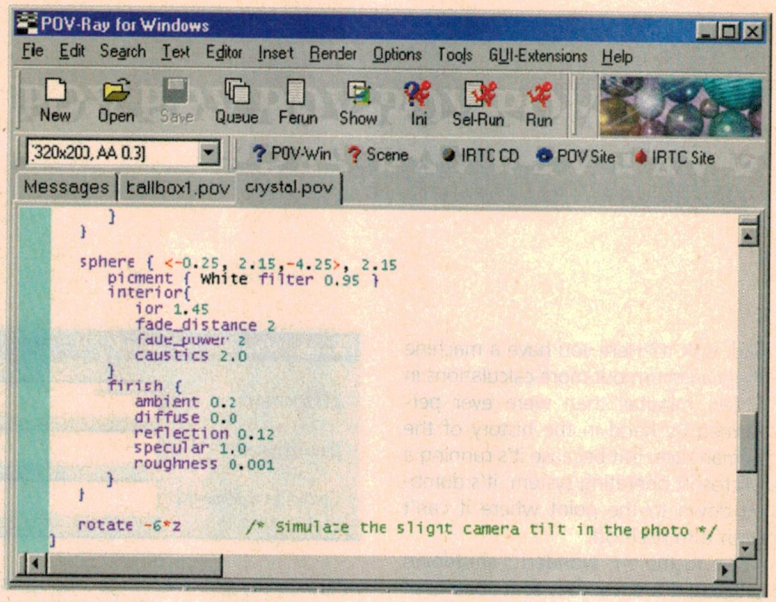
# Computer Clinic

'write once, run anywhere' ideal, neatly crippling it before it could really get off the ground.

Then there was Native Signal Processing, one of Intel's clever ideas for multimedia enhancements... It made cross-platform development too easy, and MS resorted to some pretty crude tactics to squash it. Then there's Quicktime, and Netscape, and... the list goes on.

Microsoft may come up with some good ideas, but even the most charitable would be hard pressed to call them champions of innovation. For a rather damning, but highly entertaining account of Microsoft's dirty business practices, check out the official Findings of Fact on Microsoft's current legal difficulties, at **http://usvms.gpo.gov**.

When it comes down to it, you really have to admire MS for their sheer gall... No, I wouldn't want to live in a world without Microsoft products, but that doesn't make them saints. They do what's good for Microsoft — any benefit to the end user is entirely coincidental. The same goes for any company, of course, but Microsoft has the power to make it stick.




***If you'd rather describe 3D objects with words rather than a mouse, try using POV-Ray. All we need now is some virtual tea...***

## Software Pick of the Month

Software pick of the month is a bit off the beaten track, but is very, very cool. It's called POV-Ray, and it's a 3D modelling and rendering package. What makes POV-Ray (the Persistence Of Vision Raytracer) different from all the other 3D apps out there is that instead of fiddling around with silly mouse controls, the scene and all the objects are constructed in a simple scene-description language.

This means that you're no longer tied to your mousing skills and irritating little dialog boxes, but can instead construct complex (and visually stunning) 3D scenes, just by tapping out a few lines of code. There's a very decent editor built in, with syntax highlighting and other nice features, a whole slew of prebuilt models, textures and scenes to cut your teeth on, a massive cross-platform community of fellow POV-Ray users if you ever need help... The list goes on.

Also, working from straight text files, POV-Ray is ideally suited for use in conjunction with text-processing programs such as Perl, to automatically generate scenes for you. I must sheepishly confess to writing a screenshot-converter once for ADOM (**http://www.adom.de**), a rather interesting little game I used to play when I had spare time. Imagine an ANSI text-based Ultima VII, and you'll get the idea.

I hacked up a little script to capture the current text screen, interpret it, and generate a 3d scene in POV-Ray... OK, so I'm a hopeless geek, and have no life, but it shows you the possibilities. Anyway, POV-Ray is free, friendly, and a lot of fun to use, so go check it out at **www.povray.org**.❖

# Vintage Radio

by Roger Johnson

# The limits to Restoration

**Restoration of vintage radios means different things to different people. For a start there are varying degrees of 'restoring', which include repairing, rebuilding and reconstruction.**

IN VINTAGE AND classic car terminology, a *concourse d'elegance* is awarded to the owner of a motor car who restores their vehicle to as close as humanly possible to the condition it would have been in when it left the showroom. As vintage radio has been an organised hobby and interest for nearly 20 years with the advent of societies and coteries, it is time that some attention was paid to restoration standards.

To the extent that may not be the case, then perhaps an article that will stimulate some healthy discussion might be worthwhile. Unlike 'Doctor Who', we cannot jump into the *Tardis* and travel back to Mick Simmonds or Hartleys stores in 1930, purchase a brand spanking new radio, then project ourselves back to our current moment in the time continuum. (It's an interesting thought, though!). In order to have a 1930 radio that looks as if it was brand new, we therefore have to undertake restoration in its many forms.

Just what are the limits to restoration? A short answer is the availability of replacement parts that were 'original', and materials and techniques that were applicable to the time. But before getting into restoring a chassis, let's look at the peripherals.

## Paints & finishes

One might be tempted to think that 'finishing' and 'finishes' applied only to cabinets, but steel chassis and other metalwork needed to have a protective finish, which was often paint of some form or another.

With regards to chasses etc., it is unlikely in the extreme that any original paint can be found that is capable of being applied. The limit to restoration here is therefore matching the colour and the texture. One must find as close a colour as possible.

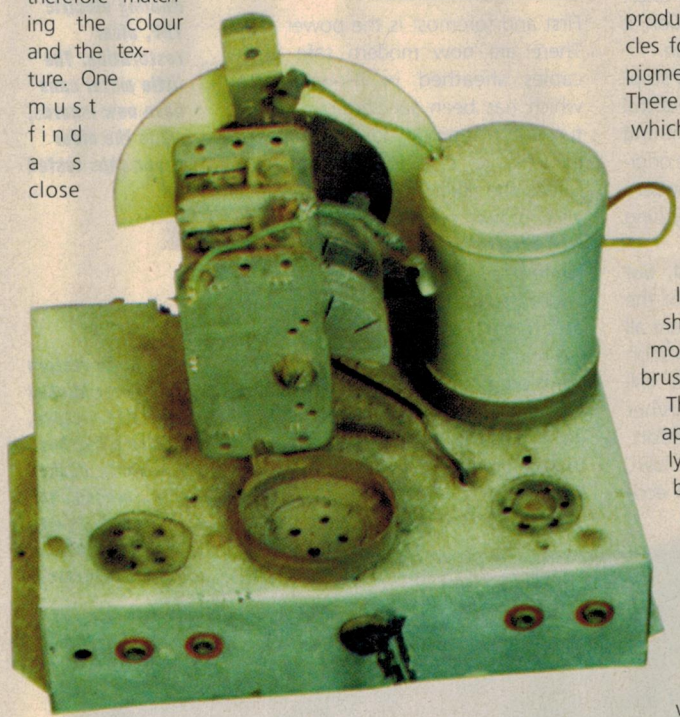


*Fig.1: This home built battery TRF set is a good example of one where everything is there, ready for a thorough restoration at minimal cost.*

Fortunately, there is a vast range of auto 'Touch-up' spray cans available at the larger variety stores and auto restockists, which fill the bill nicely. Find the closest colour in a metallic finish, as this finish and patina are equally important as the colour.

As far as cabinets are concerned, the early coffin box cabinets of the 1920's were invariably finished in shellac, or 'French Polished'. To this day the same materials and techniques apply; the practice is as old as the hills. So there are no limits to restoration when it comes to French Polish.

In the late 20's, timber was finished with a spray application of clear, or occasionally slightly tinted, nitro-cellulose or 'Duco'. Yes, this is the same product that was used on motor vehicles for 35 years, except without the pigments used in the motor trade. There is a product that is now available which is nearly the same (Wattle 'stylewood' or 'isolac' spray finish). However, these products are not generally intended for the occasional user and need to be applied with a spray gun. Ideally, cabinets of that period should be finished as such, but more often they are finished with a brush and a polyurethane finish.

The problem here is that a brush application of polyurethane is clearly identifiable as 'not original'. A better finish can be had by polishing it afterwards with a very fine metal polish ('Brasso'), or an application with Teak Oil. Better still, most hardware stores have a range of very authentic look-alike finishes as a result of the housing restoration boom. So it's wise to ask around, visit more than one store if necessary, and to swap notes with other enthusiasts to get the most authentic look possible.

## Speaker grille cloth

For many years there was nothing that remotely resembled the original speaker grille cloths used in early radios. Restorers persevered with curtain material, which was passable at best. However thanks to the boom in the United States, exact copies of some of the famous brands have been made in economically viable quantities.

Some Australian collectors import larger quantities and sell off smaller pieces, and they will advertise in Society magazines. The cost per radio

for these quite authentic looking grille cloths is quite modest.

## Practical limits

Perhaps we should establish some rules. Personally, it is my opinion that restorers should try and emulate the radio chassis as it left the showroom — but to return to this month's title, there are definite limits. The first limit is undoubtedly cost; the second is time, and the third is replacement parts.

A repair is the minimum amount of work to enable the receiver to function to its original design. Sometimes a repair is a virtual restoration, inasmuch that there has been virtually no alteration to a chassis, and by implication, it resembles its showroom condition.

A rebuild can be considered as stripping a chassis, replacing all doubtful parts, giving it a new coat of paint and reassembly — usually not to the original wiring layout and using modern replacement components, or anything handy that will work.

Restoration is as for a rebuild, but going that big step further in that the chassis, components and wiring are all kept as original as possible. Restoration takes time, and often the restorer will not benefit financially from his/her considerable time, expertise and effort. Restoration is often a labour of love, where a rebuild is more like an economic proposition.

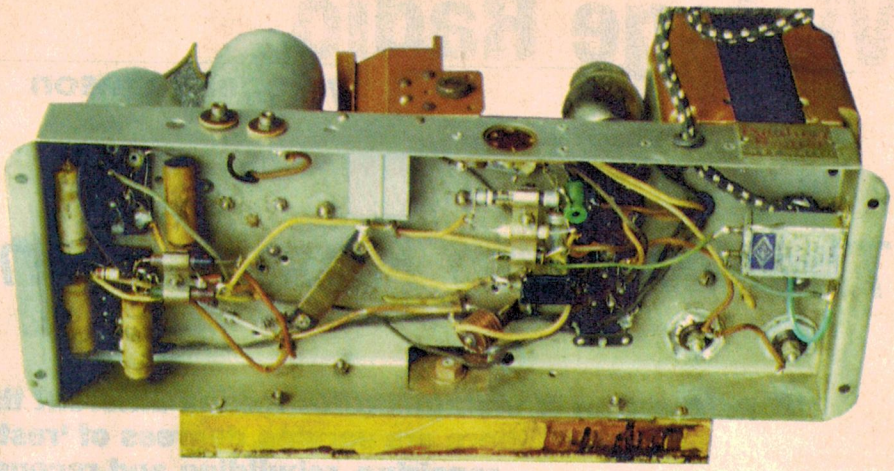


*Fig.2: Under the chassis of a 1933 Healing electric TRF, after restoration. The little metal cans have new innards, while the older paper caps tested OK.*

## The electrics

First and foremost is the power cable. There are now modern safe power cables sheathed in brown cotton which has been specifically manufactured for reproduction and 'period' light fittings. It looks good on radios. Failing the ability to procure this look-alike brown cotton covered flex, the next best thing would be the black and white-trace flex especially made for household clothes irons. It is the next best thing, and still looks the part.

A burnt out power transformer? With the more popular and more numerous sets, particularly post war, quite often a derelict chassis can be obtained and a replacement can be salvaged. Otherwise, a replacement with the same voltages can be pressed into service that may require some hacking of the chassis. This is unfortunate and should be avoided if possible.

The limit here is no doubt cost. Very few repairers or restorers would, unless there were exceptional circumstances, consider having the power transformer re-wound, as it costs from $80 to $100. However, if you want to be serious about all this, then go ahead...

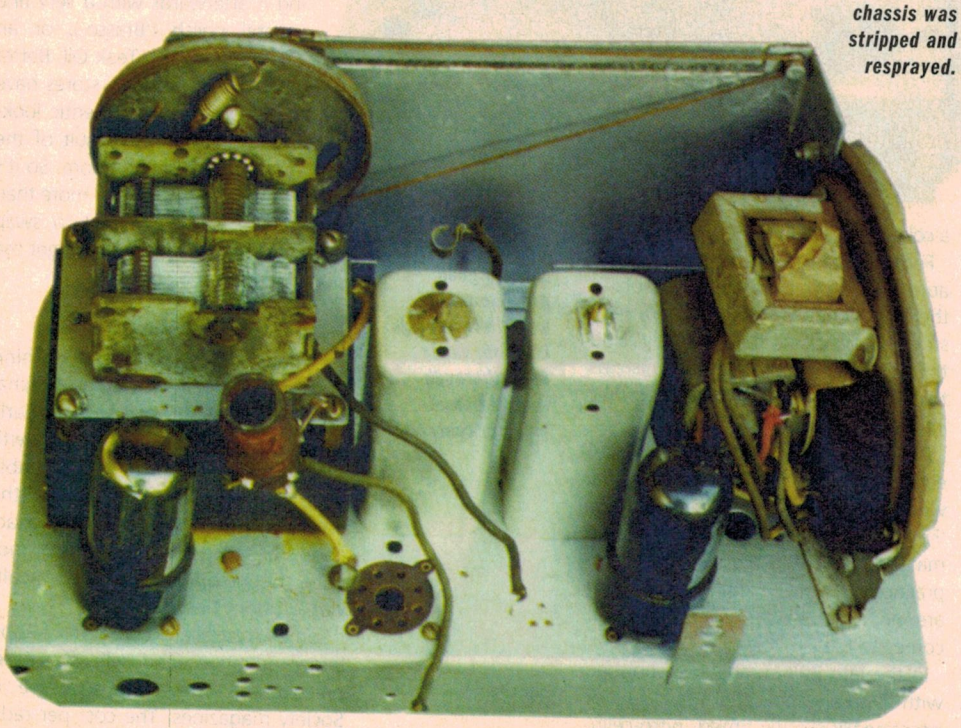


*Fig.3: To restore this Astor Mickey of 1941 vintage, which had been badly 'hacked around', the chassis was stripped and resprayed.*

## The circuit

Fortunately, the Historical Radio Society of Australia has compiled books of circuits taken from their considerable source of trade journals of the 1930s and combined them by brand name. They have Astor, Healing and Tasma books, and fortunately AWA circuits have been made available by the factory since 1929. From 1937 most, but not all, Australian manufacturers made their circuits available for the *Australian Official Radio Service Manual*. The society has reference to many, but not all circuits of other brand names.

Clearly another advantage of being involved with a society here or in New Zealand is that this is a service available to members.

What if there is no circuit available for your set? It is possible to trace the underchassis wiring yourself, providing it is complete or nearly so. The 'Racophone' model 41E described in this column some 18 months ago was just such an example.

Otherwise, it is a matter of guesswork, relying upon the techniques of the day, and techniques used in other sets by the same manufacturer. I had to do this with the Racophone 41E's power supply, which was obviously altered. The article on 'making something from nothing' is an example of

judicious guesswork. The important thing is to fathom a circuit that was typical of both the manufacturer and the era, using whatever clues remain.

## Speakers

Electromagnetic speakers, in which the speaker field coil doubled as the smoothing choke, were used on practically all electric radios until WW2, and then on many brands during 1946 and 1947. An open circuit output transformer can usually be replaced by one scrounged from a similar derelict chassis, but if the field coil is open circuit, you do indeed have a problem. Unless you are in the singularly fortunate position of having a vast array of spares, some improvisation is needed.

Quite often there is no alternative but to use a post-war permagnetic speaker. This poses another problem: what to do to get rid of the 150V or so which were dropped across the field coil, and also what to do about HT smoothing.

If an underchassis choke is pressed into service, the chassis will need to be drilled, thus detracting from its originality. To substitute the lot with a resistor means a 2500-ohm resistor capable of dissipating at least 10 watts — which will then get VERY HOT.

Perhaps a better solution is to mount a smoothing choke and voltage dropping resistor on the speaker baffleboard. Then at least the original 4-pin speaker plug can still be used, and the chassis will remain intact.

## Coils and IFTs

Particularly with post war radios, there was much standardisation when it came to coils and IF transformers. Should they be needed, replacement IFTs are often readily available from discarded chasses. The same can be said, although not always, for coils.

The most likely coil to give trouble is the oscillator coil. Even if it is continuous, it may not oscillate, probably due to the ingress of minute amounts of moisture.

With older, i.e. pre-war chasses, the degree of standardisation was not nearly as apparent. (Fisk Radiola chasses are a possible exception, as their IFTs and coils from 1937 to post-war production were very standard.)

This era was the heyday of the square-can IFT with compression trimmers. In some instances there were almost exact look-alikes on rival brands. To maintain as much originality as possible, try putting a replacement assembly inside the original can.

The IFTs of the early superhet (autodyne) era were once again fairly standard. These were invariably 'Radiokes' or 'Eclipse' brands, in cans which are about 70mm in diameter and about 90mm in height. Replacements for these types is often easier than for the later 30's sets.

As for the coils? Well, not a lot can be said or done. The real devotees will attempt to rewind the coils, which is by no means easy or convenient. Otherwise, as close as a replacement to the original is about all that can be expected.

Solenoid coils can easily be rewound even if there is no cotton-covered wire available. For those fortunate to have access to DCC (double cotton-covered) wire, a very good replica can be made.

## Resistors & capacitors

Hmmm... Unfortunately, modern resistors are much, much smaller than their older counterparts. They also look completely different. A possible suggestion could be to use the modern ceramic-form five watt variety which have long leads, are rectangular in shape, but best of all are large.

Some very early resistors did not have the usual markings, and were either gray or green in colour. Perhaps the modern varieties could be painted to give some semblance of originality...

As for capacitors, again greencaps and other modern types look very much out of place. But there are ways around this problem.

Depending on your degree of devotion, the sealing wax can be melted out of the old tubular types, the insides slid out, a new greencap or similar component placed inside the old cardboard tube, and then re-sealed with the same wax. It is time consuming, and some would say completely unnecessary, but if you want to be serious, it does give a much more 'original' solution.

*Fig.4: This cabinet for a Racophone 41E has been rejuvenated quite successfully, as the original finish was basically quite sound.*

## Valve types

Replacing lost or 'dead' valves *can* be problem, especially with rarer types. Without doubt, the B5 based anode-top 4.0V types such as the E442 used in the Philips 2510 and a few other radios are very hard to come by. If you know what you are doing, you can re-base the same type or an equivalent with a UY base.

Other than that, most valves in the pre-octal and octal series do not present a problem for the average domestic radio. This is another big advantage of joining a radio club or society — the ability to advertise your wares and your needs, and valves are no exception. The limit to replacement valves is generally one of cost, not availability.

In closing, something should be said about preserving battery sets. Battery sets are an important part of our radio history if not social culture, and should be preserved as such. Small power supplies to run them can be constructed by the enthusiast at little cost, and in the coming months this topic will be explored in more detail. ❖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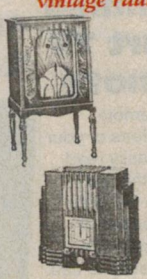

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## CCD Colour Camera with Pinhole Lens and Audio

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This amazing little surveillance camera is smaller than a matchbox and can be hidden just about anywhere. Great for surveillance and security applications where small size and good performance are important. The camera has an f3.6mm pinhole lens, and in built high sensitivity microphone. 12VDC±10% @130mA is required. Use our MP-3220 or MP-3030.

Cat. QC-3486 **$229**

## CCD B/W Camera with Sony Chip and Audio

NEW

This tiny camera includes an f3.6mm lens, and provides 400 TV line resolution from a 1/3" Sony CCD image sensor. The camera has a high sensitivity microphone and is ideal for applications that require small size and broad coverage. Video connection is BNC and audio is RCA. Requires 12VDC ±10% @ 120mA. Use our MP-3220 or MP-3030.

Cat. QC-3476 **$149**

## Digital Colour Camera with Sony CCD Sensor, Audio and Auto Iris Option

This commercial quality DIGITAL colour camera uses a Sony CCD image sensor and accepts interchangeable C & CS mount lenses. It is ideal for use in well-lit areas such as homes, offices or showrooms. Fitting the appropriate 4mm, 6mm or 8mm high-resolution lens gives close-up or overall views and will vary surveillance coverage. This camera will also accept our auto iris lenses and has a built in hi-sensitivity microphone for audio coverage 12VDC power required. Note: Must be regulated. Lenses not included.

Lenses to suit: 4mm QC-3315, 6mm QC-3316, 8mm QC-3317, Auto iris QC-3320

Use our regulated adapter Cat. MP-3030.

Cat. QC-3304 **$309**

NEW

## NEW CATALOGUE NEXT MONTH

## Time Lapse Video Recorder

NEW

Purpose built for security applications, this Korean made, high quality centre drive unit will record video & audio for up to 24 hours on a single E-180 tape. Recording times can be programmed for certain time periods on a daily or weekly time frame. External triggers can also be used to automatically record on receipt of alarm signals from PIRs, door switches, IR beams etc. One shot recording mode will record 1 frame of video at 1, 2 or 3 minute intervals. Playback options include normal, still, reverse, field by field, slow & slow reverse. At the end of the tape, the recorder can be set to automatically rewind and record over the previous recording, or eject at the end of one pass and stop. Several recorders can be cascaded together. As the first recorder reaches tape end, it can signal the next recorder to start recording, and so on. Donít let the low price fool you. This is a high quality,security recorder for professionals.

Cat. QV-3050 **$995**

## 17" Toolbox with Storage Lid

NEW

We just love gadgets, and this utility box has to be one of the most versatile we have seen. The lid acts as a docking station for 4 smaller boxes, which slide into specially molded bays. Each of the smaller boxes has its own hinged lid & 6 compartments. Inside is a full-length removable tray with 4 compartments and 2 x built in rulers.. This box would be great as a general toolbox, tackle box, sewing box or whatever.

Cat HB-6326 **$17.95**

## 12" Toolbox with Storage Lid

NEW

This is a smaller version of the utility box described above. This one has 2 detachable containers and a removable tray.

Dimensions: Main box measures (Inc. lid) 140 (W) x 135 (H) x 155mm (D). Small boxes measure 115 (W) x 27 (H) x 65mm (D).

Cat. HB- 6327 **$12.95**

## Preprogrammed Smart TV Remote

NEW

This pre-programmed remote operates the main functions of your TV and features large, easily read buttons. The unit is terrific and great to give the kids so the good remote does not get wrecked or lost. The unit is programmed for over 600 models and is easy to use.

Cat. AR-1703 **$19.95**

## 30 Drawer Parts Cabinet

NEW

This cabinet in ideal for workshop use and can be wall mounted. Stack multiple units together for larger storage requirements. Overall dimensions 280 (W) x 210 (H) x 130 (D)

Cat HB-6323 **$16.95**

## 16 Drawer Parts Cabinet

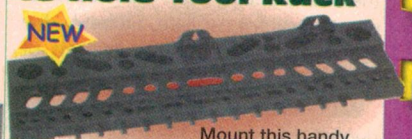
NEW

Another useful storage cabinet, this time in a 4 draw x 4 row configuration. Overall dimensions 225 (W) x 145 (H) x 90 (D).

Cat. HB 6319 **$9.95**

## 48 Hole Tool Rack

NEW



Mount this handy tool tidy on a wall near your workbench & you can have up to 61 individual tools within easy reach. Includes 13 hooks for hanging test leads etc. 600Wx55Hx155 D.

Cat. TH-1962 **$7.95**

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## 28 Compartment Storage Box

NEW

This see through plastic storage box has removable partitions allowing the box arrangement to be customised to suit your needs. The box can be configured to have anything from 4 big compartments to 28 small or anything in between. Cat. HB-6313

**$9.95**

## 18 Compartment Storage Box

NEW

Similar to our 28 compartment unit, this storage box can also be configured in a wide range of variations. The basic box has 6 compartments that can be divided into 2, 3 or 4 sub-compartments using the dividers provided
Cat. HB-6312

**$6.95**

## Large 6 Bin Parts Rack

This handy parts rack holds a variety of components in neat, see through trays that tilt down to an angle of 45 degrees for easy access. Overall dimension is 600Wx110Hx90D. Cat HB-6318

NEW

**$16.95**

## Small 6 Bin Parts Rack

Similar to our large parts rack, this unit is designed to house smaller items such as ICs, nuts, screws etc. Can be wall mounted and multiple units can be used for larger storage requirements. Size: 400Wx75Hx60D
Cat. HB-6317

NEW

**$7.95**

## 6 Compartment Mini Storage Box

See through plastic makes it easy to view the contents of this 6 compartment mini storage box. 2 snap action fasteners which firmly hold the lid closed.
Cat. HB-6309

NEW

**$2.95**

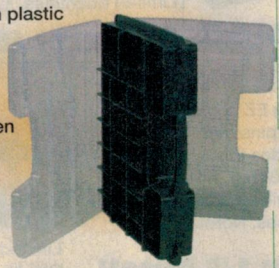
## 5 Compartment Mini Storage Box

This box is ideal for carrying small components and is an indispensable addition to any tool kit. Its see through plastic construction enables the contents to be easily identified.
Cat. HB-6308

NEW

**$1.95**

## Double Sided Component Storage Box



See through plastic covers lets you see where things are and when the lid is closed, cleverly integrated slots seal around the compartments to prevent the contents spilling. The box has 10 compartments on each side. Overall dimensions 290 (W) x 210 (H) x 70 (D).
Cat. HB-6315

NEW

**$9.95**

## Karaoke Microphone

NEW

This mic is designed for karaoke, but can be used as a standard vocal microphone. It is housed in a black die cast body with an on/off switch. The mic has a cardioid polar pattern to reduce noise, and comes in a really cute karaoke carry case. Supplied with 5 mt. lead to 6.5mm plug.
Cat. AM-4086

**$39.95**

## 24 Compartment Storage Box with Carry Handle

NEW

This storage box has 24 compartments of various sizes The 4 largest compartments have 5 removable dividers that can be taken out to make progressively larger compartments. Overall dimension: 370 (W) x 65 (H) x 285 (L).
Cat. HB-6314

**$9.95**

## 6" Dual Channel, Auto Switching Security Monitor

NEW

Ideal for small surveillance installations, this B&W security monitor has a host of useful features. A built in switcher enables permanent display of inputs 1 or 2, or AUTO mode to automatically switch between them. The switching time can be adjusted with the front panel control and is variable anywhere between 2 to 20 seconds. Power, volume, input select and timer interval controls are all found on the front of the monitor and a small tilt stand is found underneath. Monitor measures 170 (W) x 140 (H) x 190 (D). 15W power consumption, Weight 2kg.
Cat. QM-3400

**$129**

## Laser Leveller

NEW

This pocket sized laser leveller is extremely accurate, but really tough. It will project a straight line (not a dot) onto any surface at a range of up to 10 metres. A built in spirit level with two viewing windows allows the beam to be perfectly aligned & powerful magnets let you attach it to any steel surface. Runs on 3 x LR44 batteries (supplied).
Cat. ST-3112

**$139**

## 10" Security Monitor

NEW

This B&W security monitor uses a high-resolution 10" CRT and is suitable for use in a wide range of surveillance & monitoring applications. The monitor is housed in a neat and compact metal case. Video and audio outputs are provided for recording purposes. Comprehensive front panel controls are provided. Measures 237(W)x240(H)x245(D)
Cat. QM-3402

**$199**

## 12" B/W SECURITY MONITOR with 4 Channel Switcher, Remote Control and Video/Audio Inputs

NEW

Another of Jaycars superb security monitors. This unit incorporates a 12" diagonal screen and 4-channel switcher. Video and audio outputs are available for display on a remote monitor or recording on a VCR. Camera inputs can be manually selected for prolonged monitoring. Front panel controls include: power, brightness, field frequency, contrast, volume, channel selectors and scanning speed and all scanning functions can be accessed with the infrared remote control. Video input can be either via RCA or mini DIN connectors. Video and audio out are RCA connectors. The monitor is housed in a robust plastic case and will operate off 240VAC or 18VDC
Cat. QM-3404

**$279.00**

## Micron Pulse Count PIR

Cat LA-5030
**Normally $26.95**
**March $21.95**
**Save $5**

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## 69 Channel UHF Hand Held Transceiver

NEW

This sophisticated transceiver operates in the uncluttered 433Mhz band & uses the full legal power to provide up to 1km line of site range. The transceiver has CTCSS selective calling, a clock with alarm and stopwatch capabilities, low battery indicator, 10 different paging tones, LCD display, plus 10 memories. Best of all, you don't need a license to use it and could save a fortune on expensive mobile phone calls. Comes with belt clip and instructions. Requires 4 x AAA batteries (not supplied). Size: 65 (W) x 105 (H) x 30 (D).
Cat DC-1000 Yellow
Cat DC-1002 Purple Cat DC-1004 Green

**Only $99ea**

## Supercardioid Pro Microphone

NEW

This dynamic microphone has a cardioid polar pattern & offers exceptional gain-before-feedback. It is particularly useful in theaters, nightclubs and outdoors where an omni directional microphone may have feedback problems. Supplied with 5 mt. of cable to 6.5mm metal plug. Case is zinc-die cast, black in colour. Includes on/off switch, lead, mic stand holder, vinyl case Cat. AM-4097 **$79.95**

## Weller Soldering Iron Tip Sale

NEW

**$35 Pack**

If you own a WTCPS/T Station or TC series Weller soldering pencil you know how good Weller soldering irons are - but how expensive replacement tips can be! We have purchased the entire remaining stock of the popular PT series soldering iron tips. They are not factory Weller tips but are a quality second source manufacturer who is an OEM tip maker for many reputable soldering iron manufacturers. The stock consists of mainly 700° & 800°F tips (370° & 430°C). Most of the tips are fairly standard, i.e. quite pointy with double-flats from 0.8 to 4.0mm. Some are up to 6.0mm (max) but in the absolute minority. None look like they could do guttering, trust us! We have decided to do a good old pack of tips. This means that you will get enough tips to (probably) last a life time at a sensational price!

**The Deal:**
The pack consists of fifteen (15) brand new prime spec Weller tips. Most of them will be either identical or almost indistinguisable from what you are using now. Our current price for replacement Weller tips is $9.95 each, with a price increase on the way.

**The Price:**
You can get a pack for $35, which works out at $2.33 per tip. As you can see, you will be in front in no time. But hurry! Quantities STRICTLY limited. These sort of deals notoriously run out quickly. Cat. TS-1370 **$35.00**

## Attention: Duratech Soldering Station Owners

We were not totally happy with the way the soldering iron sits in its holder. So, we have organised a new better fitting retainer collar for them. If you own a TS-1380, call into any store for a free new collar, or ask for one to be added to your next mail order.

## "Intelligent" DMM

•Triple display •2 x 3.75 digit •1 x bargraph •Can measure two factors of one electrical quantity •Auto ranging •Manual ranging overide •Recording (min, max, avg) •Secondary digital display shows recording time •Relative mode (real time value less reference value in units or %) •Auto/manual data hold •Frequency •Transistor/diode test •10A •Capacitance test •40 meg •Holster included. Cat. QM-1270

**Was $179.50 Save $50**
**MARCH $129.50**

## Multimeter Madness

### MINI DIGITAL

3.5 digit, diode & battery test
**Was $15.95**
**MARCH $12**
**Save $3.95**
QM-1400

### MINI DMM

3.5 digit, diode test, case **Was $16.95**
**MARCH $10**
**Save $6.95**
QM-1410

## Smart TV Remote

This pre-programmed remote is ideal for kids or the elderly because its so simple. Works with over 600 brands of TV's. Only 6 buttons.
**Cat. Price $24.95 Save $8**
**MARCH $16.95**
Cat. AR-1702

## Computer Laptop Bag - Regular

NEW

This stylish bag is Navy Blue & made of Microfibre, a high-tech but very durable stiff cloth. The purpose of the bag is to carry your laptop in safety & security. There are heaps of pockets & zippered compartments to store discs, etc and a shoulder strap for easy travel. This bag would be ideal, for carrying your laptop & paperwork on a airplane for a quick interstate overnighter. You could even carry some undies & a toothbrush within its generous spaces.
Cat. HB-6377 **only $39.95**

## Computer Laptop Bag - Large

NEW

Similar style and quality to our regular bag this one has just a little more of everything; however. It will take the largest of laptops and has a velcroed pouch for your mobile phone. The laptop pocket unzips to allow you to actually use the PC with it still in the bag. There are heaps & heaps of other thoughtful compartments - many in nylon webbing & zippered or velcroed
Cat. HB-6378 **only $59.95**

## Snap Action Keyboard Switch Bargain

NEW

SPST PC mount. Pin spacing 5mm. Gray in colour, square front to switch
Cat. SP-0728 **Normally 95c ea.**
**Only 50c ea. or 10 for $4**

## 40 Way Ribbon Cable Suppression Sleeve

NEW

2 piece, held together with metal clips. Size 65 x 28 x 13mm. Normally about $7 each.
Limited quantities. Cat. LF-1285
**Only $2.50ea or 10 for $20**

## TO 220 Heatsink Bargain

NEW

TO 220 heatsink, THM6025. Size 30(H) x 23mm excluding pins.
Limited quantities. Cat. HH-8501
**50c ea. or 10 for $4**

## EZ Hook Test Clip Pack

NEW

This pack consists of 7 x 40mm long EZ hooks, which are suitable for IC's, transistors, PC pins etc. Push syringe action. The pack includes the following: •1 x Blue, 1 x Yellow, 1 x Green, 1 x Red, 1 x Black plus 2 more, which will be any of the colours shown. Pack quantity 7 pieces. Normally $1.20 each, so pack is worth $8.40.
**Only $3.95 - Less than 1/2 Price!!**
Limited quantities.
Cat. HH-3088

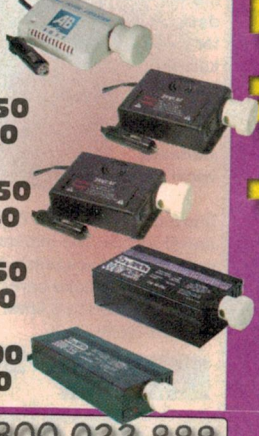
## High Quality 3 PC/Solder 9V Battery Holder

NEW

This is a quality 9V battery holder, which incorporates PC pins with mounting hole pitch of 12mm, and solder tags. The 9V battery is held tight into the holder. Size 58(L) x 30(W) x 27(H)mm, excluding pins.
Cat. PH-9236 **$1.50**

## Inverter Madness

**Buy Now and Save $$$**
See 99 Cat. page 105 for details



**70 Watt 12VDC to 230VAC**
Cat. MI-5034 **Was $79.95**
**March $59.95 Save $20**

**200 Watt 12VDC to 230VAC**
Cat. MI-5038 **Was $169.50**
**March $129.50 Save $40**

**200 Watt 24VDC to 230VAC**
Cat. MI-5039 **Was $169.50**
**March $129.50 Save $40**

**300 Watt 12VDC to 230VAC**
Cat. MI-5042 **Was $239.50**
**March $199.50 Save $40**

**500 Watt 12VDC to 230VAC**
Cat. MI-5052 **Was $379.00**
**March $329.00 Save $50**

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## Five in One Pre-Programmed Remote Control

Includes codes for over 20,000 different models of equipment, including TV, SAT, VCR, TAPE, CD and AMPLIFIER. See 99 Cat. page 217 for full details. Cat. AR-1704

CRAZY PRICE

**Cat. Price $44.95**
**March $29.95** **Save $15**

## NEW Drill Batteries

Master brand replacements

7.2V 1400MAh NICAD SUITS MAKITA AND OTHER DRILLS
Size 139(H) x 27 x 48mm. **$79.95**
Cat. SB-2316

9.6V 1400MAh NICAD SUITS MAKITA & OTHER DRILLS
Size 182(H) x 28 x 48mm. **$109.95**
Cat. SB-2318

## NEW Energizer Batteries

2L76 LITHIUM PHOTO BATTERY
3 VOLT (Replaces DL 1/3N, CR 1/3N
Size 11dia. x 10H **$16.95**
Cat. SB-2405

CR2450 3 VOLT LITHIUM BATTERY
Size 24dia. x 5H **$5.95**
Cat. SB-2521

## New Phone Extension Leads

Save a fortune over normal price. To give you an example of how low these prices are, a 3 mt. lead sells for $10.95 and a 15 mt. lead sells for $15.95.

CRAZY PRICES

| | | | | | |
|---|---|---|---|---|---|
| **2 Metres** | Cat. YT-6011 | **$6.95** | **25 Metres** | Cat. YT-6017 | **$14.95** |
| **20 Metres** | Cat. YT-6016 | **$12.95** | **30 Metres** | Cat. YT-6018 | **$16.95** |

## NEXUS NETWORKING HUBS

### 4 Port Hub

Ideal for small networks that require high performance at an affordable price. Two hubs can be stacked to increase network capacity. Features RJ45 jacks, indicator LED's, external switch mode power supply and 26 way expansion cable for stacking 2 hubs together. •30mm x 148mm x 125mm •100 Mbps Data transfer •RJ45 1/MPR Uplink Port •RJ45 Work station connectors •Power, Collision, Link/ Activity & utilisation indicators Cat. YN-8080

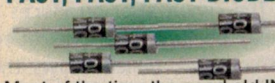
**ONLY $199**

### 16 Port Hub

Features RJ45 sockets for work station connection. AUI & BNC connectors provide network access. Link and activity indicators show the status of all ports with other indicators showing power, collision status. These hubs can be cascaded up to 4 levels to provide easy expansion. Size 50mmx110mmx440mm(W) •Data Transfer Rate 10Mbps •DB-15 AUI & BNC connectors •RJ45 Uplink Port 16 RJ45 connectors on front panel •Power, Collision, AUI, BNC, and Link/Activity indicators •Complies FCC part 15, Class A/CE Mark Cat. YN-8074

**ONLY $219**

## FAST, FAST, FAST DIODE BARGAIN



CRAZY PRICE

Most of the time the good old IN4000 series diodes do a good job. Rectifying 50Hz mains, no problem. Be it your application calls for fast recovery, they are hopeless. They are really useless around switchmode power supplies or for spike suppression, for example. The Rectron SF12 is a glass passivated one amp, DO-41 high reliability, low forward voltage drop, low leakage, high surge capability rectifier moulded in UL94V-0 flame retardant epoxy. Well & good you say. Well, it also has a maximum reverse recovery time of 35nS! This is very fast indeed! We have bought a squillion of them at a great price & now offer them to you. They are packaged up into convenient bags of 100. Yes, they only have a peak-inverse (VRRM) voltage of 100 but otherwise sensational. Especially at $2.00 for a hundred. HOW CAN YOU GO WRONG???

**Pack of 100 SF12 Rectifiers** Cat. ZR-1000 **$2**

## Cat 5e Coupler 8P/8C

This coupler makes short work of small Cat 5 cabling jobs and enables pre-made cables to be used throughout. Simply clip into a wall plate and plug cables in on both sides.

Cat. YN-8032 **$17.95**

## GAS SOLDERING IRON

**$59.95**

Brand new tool includes a soldering tip and a hot flame (1300°C). It features Piezo ignition, adjustable flame, safety lock and integral folding stand and cap.
Cat. TS-1290

**SPARE TIPS**

Solder Tip/Catalyst Cat. TS-1292 **$17.95**

Hot Blow Tip / Catalyst Cat. TS-1294 **$17.95**

## HUNG CHANG 20MHZ DUAL CHANNEL, 4 TRACE, OSCILLOSCOPE

This is our newest dual channel oscilloscope and is designed for the professional and enthusiast alike. It is a practical instrument with well thought out features including a big 6" screen for easy reading, zero parallax graticule to eliminate reading errors, TV synch separator for stable synching of TV video signals and high sensitivity input amplifiers for measuring down to 1mV/div. The heavy-duty rear feet double as a power cable tidy and the versatile carry handle folds down to form a sturdy stand. The CRO is housed in a pressed steel cabinet and the control panel is clearly marked and functionally laid out. Up to 4 traces can be simultaneously displayed using the ALT-MAG and ADD functions while advanced trig circuits ensure stable triggering even with two unrelated signals.

From the large clear 6" screen to the comprehensive and well laid out controls, this CRO is as good as it looks!
Cat. QC-1908 (Probes not included)

**$699**

**Introductory special - buy 2 probes for the price of 1 Pay $37.50 - Save $37.50**

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# Six-way expander unit
## for the Moisture Activated Sprinkler system

**by Michael Jeffery**

**When connected to the Moisture Activated Sprinkler system from the July 1999 issue of EA, this add-on unit allows you to setup an automatic watering system that uses up to *six* independent sets of moisture sensors and solenoid valves. As each section of your garden will then get just the right amount of water for the localised soil moisture, you can trundle off on holidays knowing that all your plants will be happy, and the next water bill won't be a nasty shock.**

Unlike most low-cost commercial sprinkler controllers which use mechanical or electronic timers to control the amount of water applied to a garden, the Moisture Activated watering system presented in the July '99 issue simply turns on a water valve when the soil moisture drops below a present value. This simple and effective method means that the garden (or lawn) will only be watered when it actually needs it, as sensed by a probe that measures the conductivity of the soil — and hence it's moisture content.

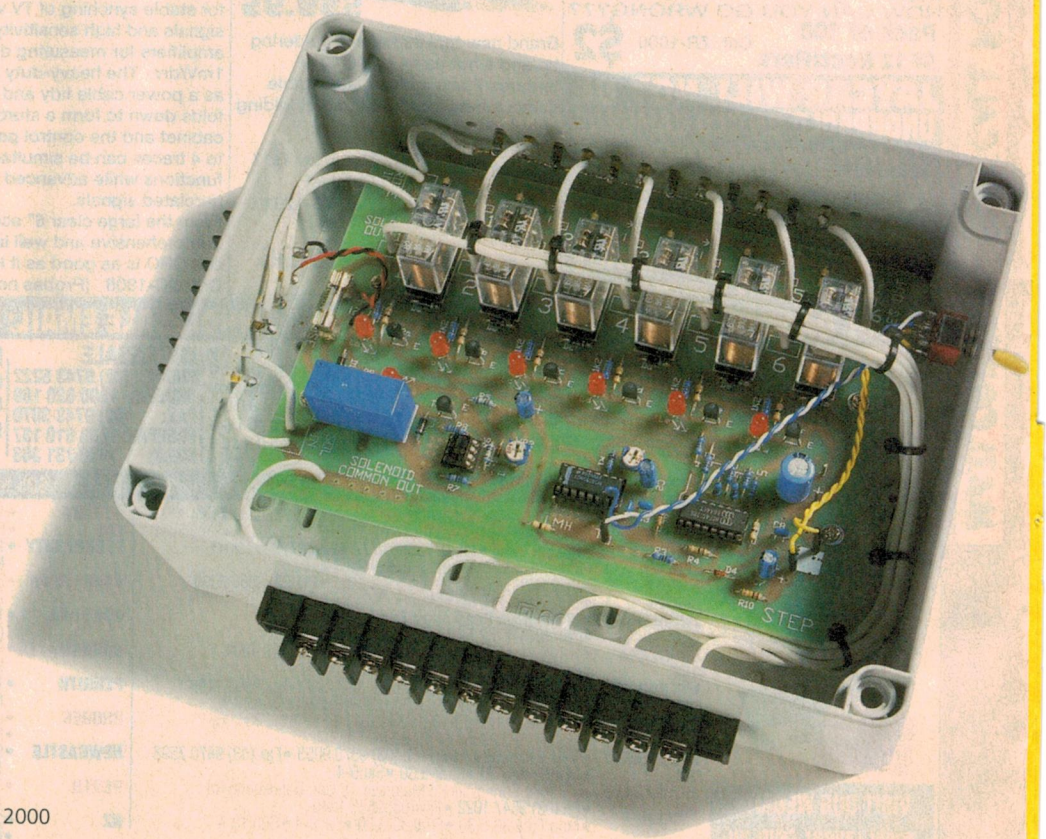
The original project used a single sensor probe to monitor the soil, and when required, applied power to a standard 24VAC water solenoid valve. While this works well, it effectively locks the unit into the soil moisture state at only one location in your garden, and there are invariably areas that need different amounts of water due to shading (or lack of) from trees, excessive or little run-off, or perhaps plants and trees that are more thirsty than others.

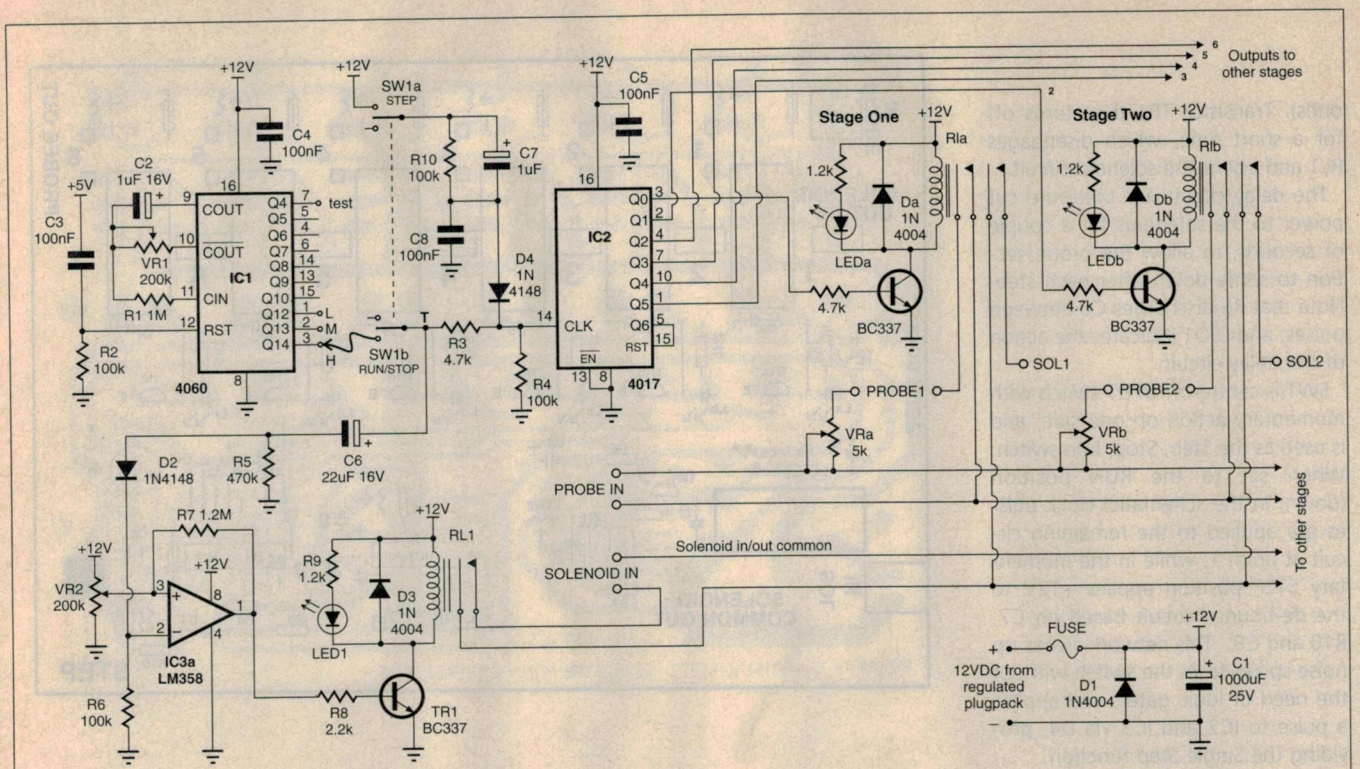
With this new add-on unit you can install up to six separate water valves and sensor probes at key locations around the garden, then wire the expander's probe and valve outputs into the original Moisture Activated sprinkler project, in place of the single valve and sensor. The add-on unit then sequentially cycles through the six sets of sensors and valves, with the main (original) unit acting as before — it doesn't know the difference, it's just that the valve/sensor sets keep changing...

The unit normally multiplexes the sensor/valves sets in 7, 15 or 30-minute steps (as set by internal links), but can also be manually stepped though the cycle, or stopped altogether. The circuit also introduces a short delay between the application of each solenoid, which allows the sensor probe outputs to settle, and reduces water-hammer effects. You can even alter the sensitivity of each water probe if you like, but you'll need to install the optional set of calibration trimpots (one per sensor) to use that feature.

### The circuit

Basically this unit is a sequential timer that uses relays as a 6-way double-pole switch, with a single step func-






***Basically, the circuit is an automatic six-way double-pole switch, with one pole selecting each probe and the other switching through the matching solenoid valve. Timing is controlled by IC1, while IC2 drives six relay stages (RIa-f) to create the multiway switch.***

tion and a delay added to one of the pole's outputs (solenoid). It also has an optional individual moisture control for each water valve outlet.

The timer (IC1) is a 4060 14-bit binary counter/oscillator, which uses C2, VR1 and R1 to set the timing rate. I have used outputs Q4, Q12, Q13, Q14, which are the Divide by 16, 4096, 8192, 16384 — the outputs on pins 7, 1, 2 and 3, respectively. Q4 (divide by 16) on pin 7 produces a much faster clocking rate and is only used when setting up the unit. R2 and C3 provide auto reset for the counter, when the unit is powered up.

With IC1's oscillator running at 9.1Hz, the 'test' output at Q4 (pin 7) will cycle every 1.76 seconds (0.57Hz), while the outputs at Q12-Q14 (pins 1, 2 and 3) will produce timing intervals in 7.5, 15, or 30 minute cycles (50% high and 50% low). These outputs are designated as L, M and H on the circuit board, and connect to the clock input of the following 4017 decade counter (IC2) via the run/stop switch (SW1) and R3.

When SW1b is in the 'run' position (down) IC2 cycles sequentially though its first 6 outputs (Q0 to Q5) driving relay stages RLa to RLf, while the seventh output (Q6) is used as a reset. You don't have to use all of the 6 outputs of course, but you will need to set the PCB links so that IC2's reset line (pin 15) connects to the next highest count output. When using four outputs stages (Q0 to Q3) for example, the reset line must be linked back to the 4017's Q4 output.

The outputs of IC2 drive standard relay stages based on BC337 transistors, with a LED indicator circuit wired across the relay coil. There are only two of the possible six stages shown on the circuit diagram, but all stages (one through to six) are identical. Taking stage one as an example, you can see that one set of contacts on RLa connects PROBE1 to the main probe 'bus', while the other switches SOL1 (solenoid valve one) to the solenoid bus. Note that VRa is the optional probe calibration trimpot, and the 'Solenoid in/out common' line is wired to one side of all solenoids.

Returning to the clock output from IC1, this is tapped off at point 'T' and sent to the solenoid delay circuit based on IC3a, half of an LM358 opamp. The circuit is fed via C6 and D2, which generates a relatively short positive pulse corresponding to each rising edge of the clock signal, so IC3a's output will fall for a brief period as set by trimpot RV2 (1 to 5 sec-

## Features

- ❑ Moisture activated, around 2% to 40% moisture content.
- ❑ Optional extra, individually variable control for each probe.
- ❑ 7, 15, 30 minute step cycles, or single step and hold functions.
- ❑ Stainless steel probes.
- ❑ Very easy and quick to set up.
- ❑ Australian designed and made.
- ❑ 12 months warranty.

All units are supplied with:

1 x 12V DC 500mA regulated plugpack power supply.

5 x moulded stainless steel probes; 160mm long, with 5 metres of cable.

Case size: 230 x 180 x 90mm (L, W, H).

Operates any standard 24V AC solenoid valve.

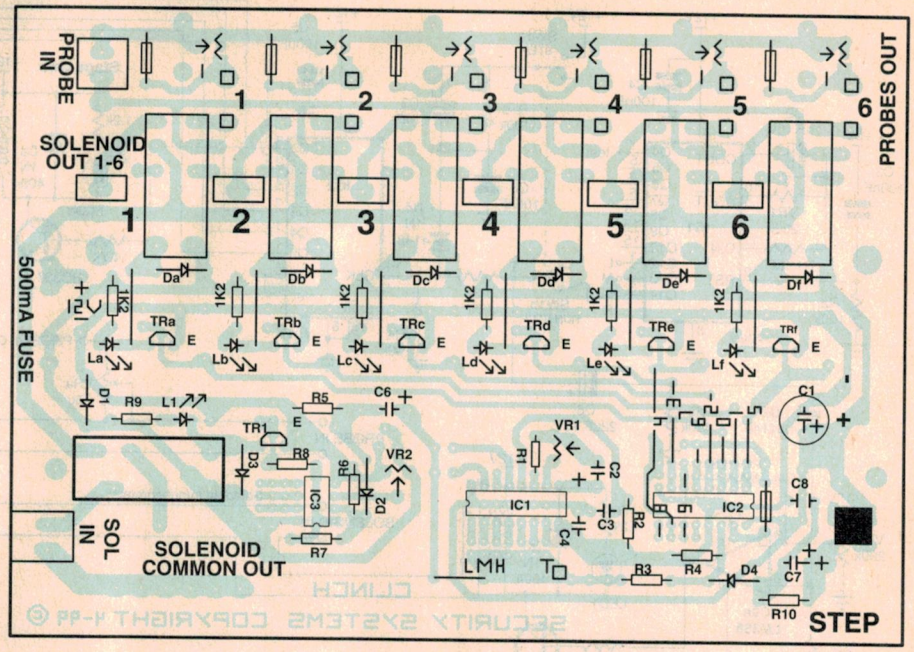
onds). Transistor TR1 then turns off for a short time, which disengages RL1 and opens the solenoid circuit.

The delay circuit will therefore cut power to the solenoids for a couple of seconds, to allow the probe section to settle down after each step. Note that R5 discharges C6 between pulses, and LED1 indicates the action of the delay circuit.

SW1 is centre-off DPDT switch with momentary action on one side, and is used as the Step, Stop, Run switch. When set to the RUN position (down, in the schematic) clock pulses are applied to the remaining circuit at point T, while in the momentary STEP position applies +12V to the de-bounce circuit based on C7, R10 and C8. This network cleans up noise spikes from the switch without the need of logic gates, and applies a pulse to IC2 and IC3 via D4, providing the Single Step function.

That's it for the circuit. In effect you end up with a set of six valves and probes, with each set stepping through one at a time according to the timing cycle you have set up on IC1. VRa to VRf provide individual moisture set points for each sensor probe, but these must be set in relation to the main controller unit's own set point. To obtain uniform moisture monitoring, you can bypass the trimpots with wire links on the PCB.

By the way, this unit could be used as a six-step sprinkler valve timer by itself, but why bother, for a modest sum extra you can have a spectacular watering system.




***The component overlay for the expander's board. Additional PCB pads are included around the timing chips (IC1 and IC2) so the timing and output options can be set with jumper links.***

## Setting up

First connect the pairs of wires from the probe and valve terminals on the existing main controller unit to the probe and valve input terminals on the new expansion unit. The polarity of these wires is not important, as long as you connect the probe to probe and valve to valve, you won't have a problem.

Now connect the regulated power supply to the 12V input terminals, noting that the white striped wire on the supply is positive. This pair must be connected correctly, otherwise the fuse will blow (thanks to protection diode D1) or the unit may be damaged and will not operate at all.

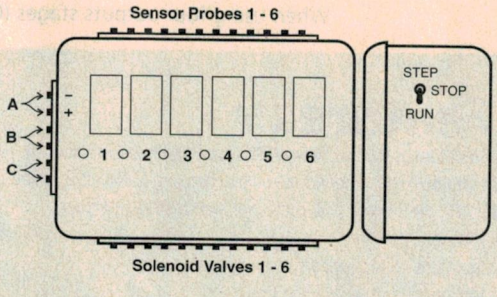
If all is well there should be two LEDs on; one on the top row of relays 1 to 6, and one on the single relay at the bottom — the delay relay. It will provide a short delay between step cycles to allow the probes to settle, and helps to reduce water hammering in the pipes.

Next, connect the probes and vales to the six-way expansion unit, then set up the main controller unit as per the original instructions. When set up in this way the unit will provide the same level of moisture monitoring to all of the probes, which depends on the pH of the soil at each site being monitored. As an optional extra of course, individual moisture monitoring for each probe can be set up.

The Toggle Switch on the side of the unit has three positions, these are;

**UP** This is the **SINGLE STEP** function; the switch is spring loaded to return to **STOP**.

**CENTRE** This is the **STOP** position;

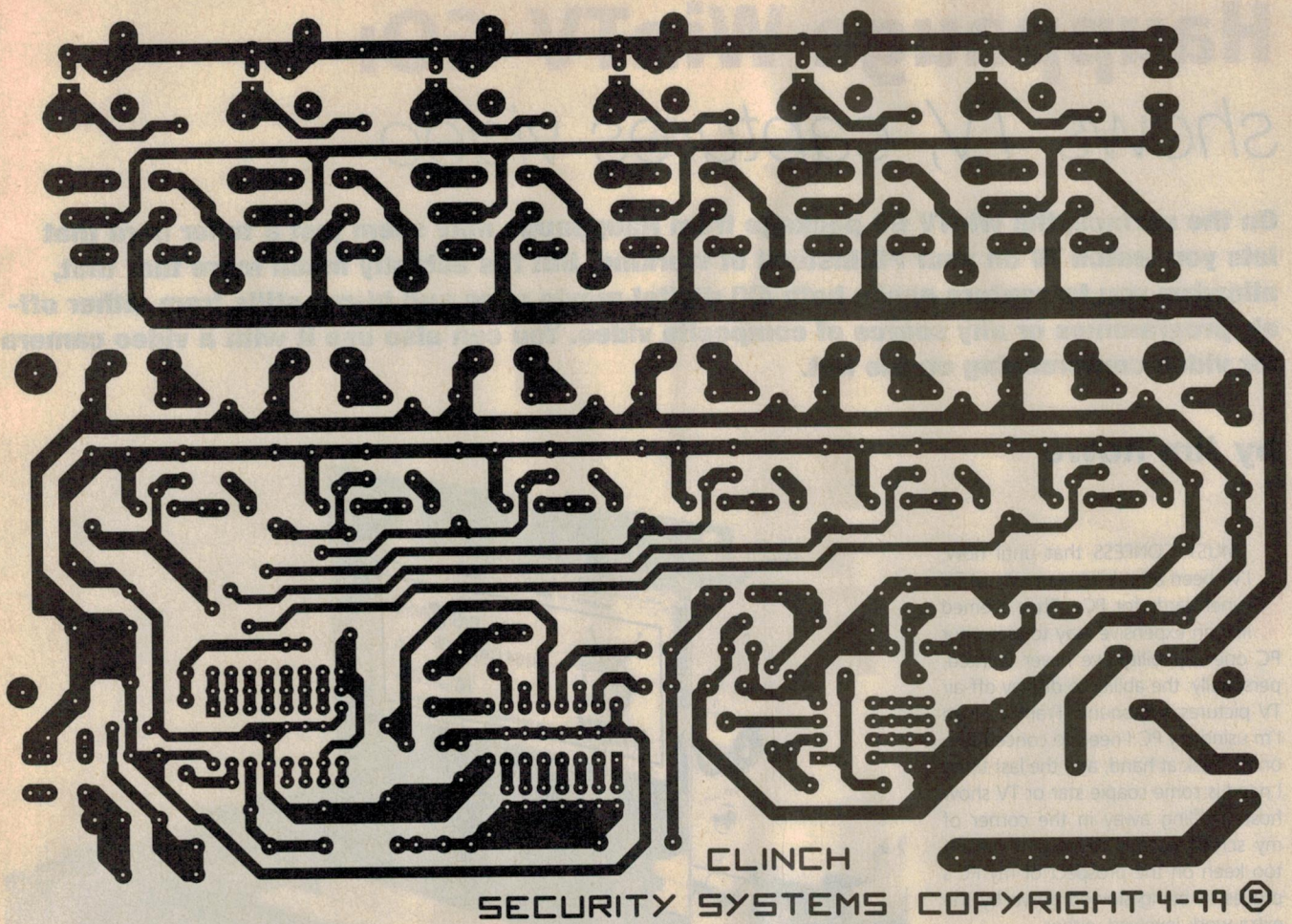



**A:** 12VDC from plugpack
**B:** to Probe terminals on Controller
**C:** to Valve terminals on Controller

***Each probe/solenoid set is switched through to the unit's main probe/valve terminals in turn – these connections (B and C) are then wired to the matching terminals on the Moisture Activated Sprinkler system.***

**Clinch Security Systems** can supply the following items for this project:

| | |
|---|---|
| PCB (solder masked with top overlay) | $27.00 |
| Plastic enclosure with clear lid | $37.00 |
| 12V DC regulated plugpack supply | $21.00 |
| Set of seven relays | $54.00 |
| Moulded probe with 5m cable | $16.00 |
| (custom cable lengths available, add $0.90 p/m) | |
| Extra instructions and assembly notes supplied with circuit board. | |
| Postage and packaging in Australia | $9.95 |
| Postage for board only | $3.95 |




***This actual-size artwork for the expander's PCB is also available on the EA website, in the Download section under PCBs.***

this will lock the cycle on one valve only.

**DOWN** This is the **RUN** position; the unit will cycle though outputs 1 to 6 indefinitely.

A circuit coard and complete circuit description are available from Clinch Security Systems, plus the parts as listed in the associated parts list. ❖

For further information on the Moisture Activated Sprinkler system and it's matching six-way expansion unit, contact:
*Michael Jeffery*
*Clinch Security Systems*
*RMB 5811 Myrtleford*
*Vic 3737*
*Ph: (03) 57562424*
Email:
**michael.jeffery@porepunkahps.vic.edu.au**

## PARTS LIST

**Resistors**
(All 1% metal film unless noted)

| | |
|---|---|
| R1 | 1M |
| R2,10,4,6 | 100k |
| R3 | 4.7k |
| R5 | 470k |
| R7 | 1.2M |
| R8 | 2.2k |
| R9 | 1.2k |
| VR1,2 | 200k 5mm trimpot |
| Links | zero ohm resistors, or wire links |

**Semiconductors**

| | |
|---|---|
| IC1 | 4060 14 bit binary counter/oscillator |
| IC2 | 4017 decade counter |
| IC3 | LM358 dual opamp |
| TR1 | BC337 NPN transistor |
| D1,3 | 1N 4004 400V/1A diodes |
| D2,4 | 1N 4148 signal diodes |
| L1 | 5mm red LED |

**Capacitors**

| | |
|---|---|
| C1 | 1000uF 25V electrolytic |
| C2 | 1uF 16V electrolytic |
| C3,4,8 | 0.1uF 50V blue monolithic |
| C5 | optional 0.1uF 50V blue monolithic |
| C6 | 22uF 16V electrolytic |
| C7 | 1uF 16V electrolytic |

**Miscellaneous**

PC board 182 x 25mm; 12V 16A SPDT PC-mount relay; DP3T switch, centre-off , momentary on one side; 2 x PC-mount fuse clips (M205); 500mA M205 fuse; plastic case, approx 230 x 180 x 90mm (L,W,H), preferably with clear lid; 12VDC 500mA regulated plug-pack; 2 x 12-way barrier style terminal strip; 1 x 6-way barrier style terminal strip; 4 x 3mm x 20mm metal screws; 6 x 3mm x 10mm metal screws; 4 x 12mm spacers; 6 x 3mm nuts and washers.

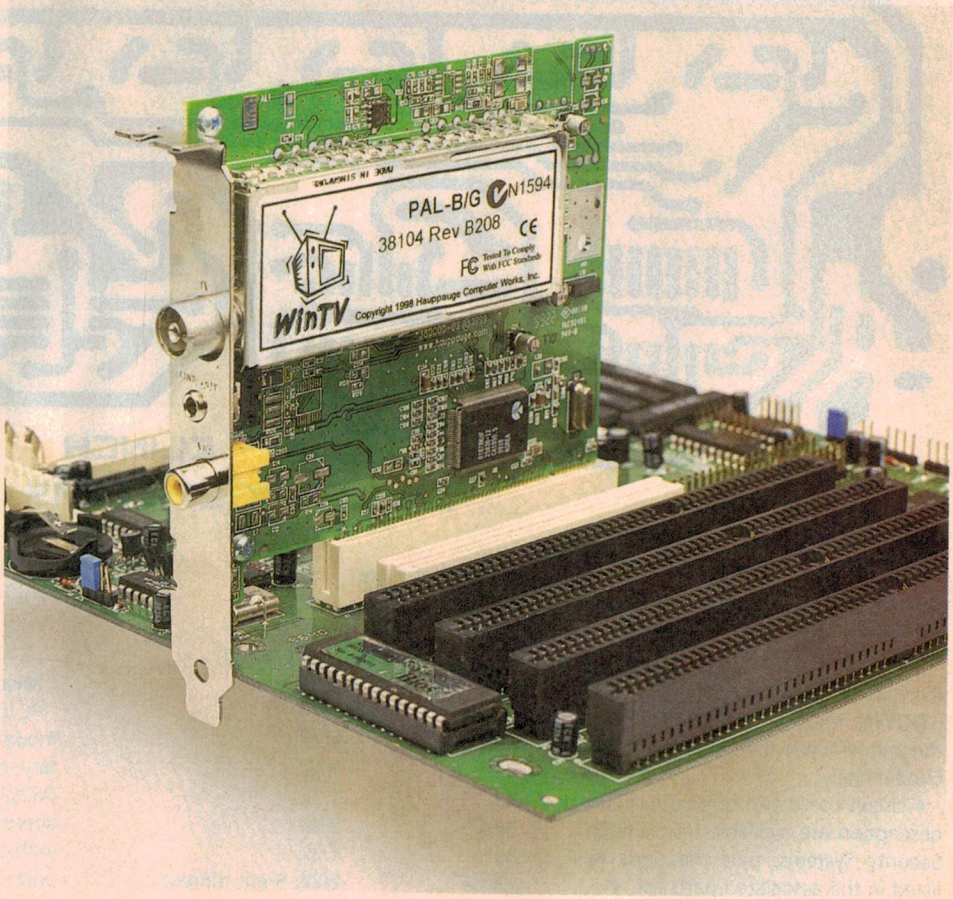
For each probe/solenoid switching stage used on output:

1 x 12V 10A DPDT, PC-mount relay
1 x BC337 NPN transistor
1 x 1N4004 1A diode
1 x 1.2k resistor
1 x red LED
1 x 5k 5mm trimpot, preferably with shaft (used only if individual moisture control needed; otherwise use a zero ohm resistor or wire link)

# Hauppauge WinTV GO:
## *shows TV, captures video*

**On the surface, the WinTV GO package from Hauppauge may seem just a tuner card that lets you watch TV on your PC instead of working. But it's actually much more that that, allowing you to capture easily both AVI digital movie clips and hi-res stills from either off-air programmes or any source of composite video. You can also use it with a video camera for video conferencing on the Net.**

**by Jim Rowe**




***TV on your PC? Plug in this nifty little PCI card and you can watch soaps all day instead of working. Sounds like a good idea, actually...***

I MUST CONFESS that until now, I've been a bit lukewarm about TV tuner cards for PCs. They seemed like an expensive way to give your PC one capability I've never wanted, personally: the ability to display off-air TV pictures and sound. Frankly when I'm using my PC I need to concentrate on the task at hand, and the last thing I need is some soapie star or TV show host waffling away in the corner of my screen as a distraction. I wasn't too keen on the prospect of my PC's processor being slowed down by the extra work involved, either.

After trying out the Hauppauge WinTV GO package, though, I have to admit to being much more favourably disposed towards this package in particular. For a start, it's not nearly as expensive as some I've seen: only $199, including sales tax. For that you don't just get a plug-in TV tuner card, either. There's also a CD-ROM with a pretty extensive suite of software applications.

Another surprise was that as well as displaying off-air TV signals on the screen, it also has a composite PAL video input which allows you to display video from cameras, VCRs, laserdisc players and DVD players as well. And although you can display the images in a fully re-sizable window as well as full screen, this *doesn't* put a big strain on your processor. In fact the main processor isn't really involved much at all; the WinTV card has its own dedicated video processor chip, which prepares the digitised video and squirts it directly into the video RAM, via the PCI bus. And the sound is piped through the sound card, so the main processor isn't involved in that either.

So your PC isn't significantly slowed down, when TV or video signals are simply being displayed. The only times that significant processor effort is involved is when you want to carry out some of WinTV's 'bonus' functions — and here there are some pleasant surprises as well.

For example as well as simply being able to display TV or video signals, the card is also a high performance frame/field grabber. You can capture and save still 'snapshots' of the image at any time, as well as being able to print them out on your printer. And the saved shots can be in any of six different resolutions, from 320 x 240 pixels for web page images right up to 1600 x 1200 pixels for use in DTP, printing or whatever. In between there's 640 x 480, 800 x 600, 1024 x 768 and 1280 x 1024 resolutions; very nice.

That's not all, though. You can also save video clips, with or without the accompanying audio, as AVI format digital AV files. Here there's a choice of some 10 different image resolu-

tions too, from 160 x 112 pixels for relatively compact files right up to 768 x 568 pixels for essentially standard resolution video (which takes a very fast processor and hard disk, as well as huge amounts of hard disk space for the monster files). There's also a choice of frame rates, five different colour encoding formats and a bunch of PCM sound sampling rates.

In addition, this AVI capability can be used not just for recording video grabs, but with a video camera, for video conferencing via the net/web. Microsoft's *NetMeeting* application is even supplied on the CD-ROM, to get you going.

Other applications that also come on the CD-ROM give the ability to display WaveTop data broadcasts and VTPlus/Teletext information.

As you can see from the photo, the WinTV GO card is a short PCI card, which simply plugs into a free PCI slot and gets its power from the PC. It has three connectors: one for the VHF/UHF TV antenna input, one for composite video input and the third supplying audio to feed to your sound card's line input (cable supplied). With the card you get the software CD-ROM, a comprehensive installation and reference manual and a Quick Installation Guide for Windows 98.

## Trying it out

I had no trouble installing the WinTV GO card and software in my HP Pavilion 6305 PC (Celeron 266MHz), although I've since heard that it can be quite finicky with some motherboard and chipset combinations. Apparently it's not compatible with Alladin and other motherboards using the ALI chipset, for example — and it does need a graphics adaptor which supports Windows' Direct Draw.

There's apparently quite a lot of information about WinTV compability issues on internet newsgroups, and you can also get information from Hauppauge via their website (**http://www.hauppauge.com**). So before you consider buying one, it might be a good idea to check up and make sure your PC is likely to be compatible.

Luckily, perhaps, my installation was without any major hiccups and I soon had two new icons visible on my desktop: one labelled WinTV 32, and the other WinTV 2000. The former is the main 32-bit Win TV application, as described in the user manual, while the latter (which doesn't seem to be mentioned in the manual) turned out to be an enhanced version which is easier and more convenient to use, once you work out how to do so...

Soon I had WinTV 2000 automatically scanning the local channels and setting up its 'active channels' tuning database, after which I tried selecting and viewing them. There was a minor glitch here, because somehow the autoscanning had missed channels 2 and 7. However it was easy to add them in manually, and then I was able to watch any channel at will — including most of the UHF repeaters in the Sydney area, which *had* been detected by the autoscanning. Even the low-power community TV station on channel 31 had been detected, and could be received at very watchable quality.

I found you can adjust the WinTV 2000 window to show almost any desired image size, from say 10% of the screen area up to about 80%, or alternatively get it to enlarge the image itself to full screen (i.e., without its 'controls' or any of the rest of your desktop being visible at all). However at some image sizes the video digitiser seemed to be having difficulty, because small 'zigzag edges' artifacts would become evident on moving objects. This also occurred with the 'full screen' option. I soon found that the best results were obtained with the window sized to give an image area of about 70% of the total screen.

Clearly there was nothing wrong with the WinTV card as far as its 'TV tuner on a card' function was concerned, though, so I tried its still frame capture and printout functions. These worked well with both off-air TV signals and video from a DVD player, and soon I had some impressive printed images from both, along with some snapshots saved to disk as standard JPG files. It was all easy to do, and the results were about as good as you could expect from broadcast TV or DVD video, respectively.

***This is a shot of a widescreen movie on DVD – any guesses as to which one? No prizes, I'm afraid.***

I also tried saving video clips as AVI files, and these worked fine too — although I found that when I saved them in 320 x 240 or better format at 15fps and with even mono 11kHz/8-bit sound, playback became somewhat 'jerky' and the sound sync came and went. Perhaps that's a sign that my Celeron processor was struggling, or that the hard disk wasn't fast enough.

I tried getting the teletext utility to find data on the Sydney channels, but without any joy. Perhaps there aren't any of our channels broadcasting teletext any more, though.

I wasn't able to try the videoconferencing or WaveTop functions, but there's no reason to believe they wouldn't work if you have the necessary camera and links at your disposal.

All in all, then, I found the Hauppauge WinTV GO package a lot more useful than I expected, and surprisingly easy to install and drive. If you're interested in adding these facilities to your own PC, it's well worth considering. But check the compatibility issues before you buy, to make sure. ❖

### Hauppauge WinTV GO

A TV tuner/video capture card for PCI-bus Win 95/98 and NT4.0 PCs, with matching software suite on CD-ROM.

**Good Points:** Good value for money; installs easily and smoothly, providing your PC has a Direct Draw compatible graphics adaptor and a compatible motherboard/chipset combo. Once installed the software is fairly easy to drive.

**Weak Points:** Not much, apart from compatibility issues; mainly a few minor glitches. It would be nice if the user manual was updated to cover the WinTV 2000 application.

**RRP:** $199

**Available:** Computer stores, or contact distributor New Magic, 7 Dene Avenue, Malvern East 3145; phone (03) 9885 5888.

# DIY Night Vision

## Using a CCD camera

**The usual way to 'see in the dark' is by using an image-intensifier tube, but this type of night viewer is generally quite pricey. Oatley Electronics has worked out a much cheaper approach.**

**by Jim Rowe**

IF YOU'D LIKE to be able to observe the night behaviour of bats, possums or other noctural animals, or perhaps a spot of undercover surveillance, one approach is to invest in an image-intensifier type 'night viewer'. These were originally developed for the military, and they certainly work. But generally they're also pretty expensive, with prices typically varying from $300 to $800...

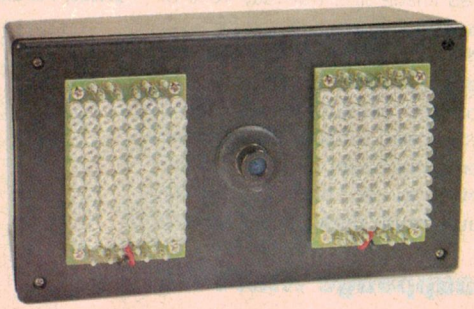
For those who don't mind a bit of experimenting, though, there *is* an alternative approach that's well worth considering. This is to use one of the sensitive but low-cost monochrome (B&W) CCD video camera modules that are now fairly readily available, with its output driving a similarly low cost portable video monitor. Most of these camera modules can produce useful images in very low lighting levels (typically down to 1 lux), which can be enough in many situations.

Even in totally dark conditions you can often 'help' this type of camera by taking advantage of the fact that they're often even more sensitive in the IR (infra-red) part of the spectrum as they are at visible wavelengths: typical units can operate at down to 0.1 lux. So by providing yourself with one or two 'IR illuminators' of the type using an array of IR emitting LEDs, you can often provide the scene with enough illumination to allow the camera to produce good B&W images, while still keeping it totally 'dark' as far as humans and most animals are concerned.

This type of system can be quite practical for viewing distances of up to 30m or so, although you might need a fairly husky battery to run the IR illuminators for 'hand-held portable' use.

Branco Justic and his team at Oatley Electronics have been selling both CCD camera modules and IR illuminator kits for some time now, along with suitable lead-acid gel batteries. So when they also added some low cost battery operated video monitor modules to their range recently, it was understandable that they'd explore the possibilities of putting them to this kind of use. The results were so interesting that they sent us some samples, including an experimental 'CCD Night Vision' setup, so we could tell you about them.

***Yep, you're right – that's an LCD panel being used as the display in this night vision scope, and it works pretty well too.***



***A miniature CCD camera is used instead of an expensive image intensifier tube, and it will operate at IR light levels down to 0.1 lux.***

### LCD display

As you can see from the photo, the experimental setup is built into a standard 197 x 113 x 64mm plastic utility box and uses one of Oatley's new video monitor modules: a backlit LCD type with an active picture area of 74 x 56mm. This comes as a complete assembly on a 150 x 100mm mounting plate, and contains the electronics for both the LCD display and the backlighting.

This monitor is actually an RGB/separate sync colour type, but can be used as a monochrome composite video monitor by connecting the three colour component inputs together and using a simple external sync separator.

It turns out that the monitor is also designed for the 'EIA' 15.750kHz/60Hz line and field rates as used in the USA, so that it needs to be used with a CCD camera module delivering this format as well. Happily Oatley stocks one of these too, and they were thus able to use it in the experimental CCD Night Vision setup. As you can see it's mounted in the centre of the box 'lid', which becomes the front of the night vision module. The LCD display is in the bottom of the box, which becomes the back.

As this camera runs from +12V DC, they've also provided a simple 12V regulator circuit on the power supply/sync separator module.

To round off this night vision setup,

they've used a couple of their 80-LED (8 x 10) IR illuminator arrays, mounted on the box 'front' — one on each side of the camera lens. Together the two arrays draw a little over 1.5A at 12V, but they do provide a very healthy level of IR illumination.

Power for the setup comes from one of the low cost 12V/7A-h sealed lead-acid 'gel cell' batteries that Oatley stocks. As the total drain is only about 2.2A, this gives an operating time of about three hours.

## Flat CRT

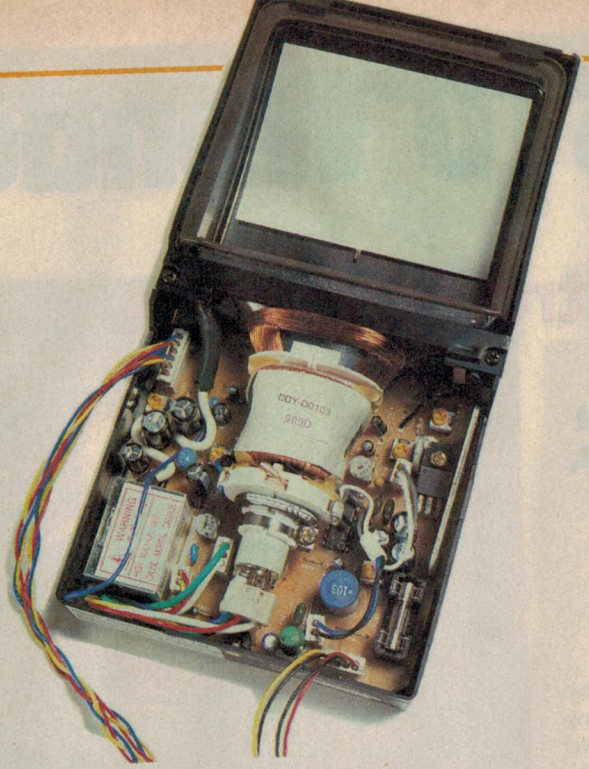
As I mentioned earlier, Oatley also has another new video monitor module available. This is one of the type made for use in domestic video surveillance and security systems, based on a 'flat' or 'bottom fire' cathode-ray tube (CRT).

With this type of tube the phosphor display coating is not on the rear of the tube's front plate, but on the front surface of its rear. The front is a completely clear and very flat 'window' through which you view the image on the top of the phosphor surface, about 25mm behind it. And the latter is not flat, but curved upwards towards the top — because the electron gun is attached to the bottom of the viewing area, and scans it from there.

As this 'oblique' scanning would normally give a picture with a high degree of 'keystone' distortion, the scanning circuitry and deflection yoke must be designed to compensate by pre-distorting the scanning currents and fields. Luckily this isn't too hard, and with the correct adjustments the resulting picture ends up surprisingly linear and 'normal looking'.

Although it includes all of the necessary scanning, EHT and video circuitry, Oatley's flat-tube monitor module is very compact. It measures only 205 x 105 x 41mm deep overall (including deflection yoke) — only a little larger than the tube itself. The tube gives a bright, sharp monochrome image measuring very close to 100mm diagonally, and the rated horizontal resolution is 450 lines. All of the electronics is on a small PC board which fits into the monitor's moulded plastic frame, just behind the tube neck and deflection yoke.

This monitor's video input accepts standard 1V/75Ω composite video, and the sync circuitry will lock onto either CCIR (15.625kHz/50Hz) or EIA (15.750kHz/60Hz) scanning rates. So it's equally at home hooked up to a CCD camera module delivering video of either format.



***These flat CRT screens are also available, and interface quite easily to a number of different cameras. They're only B&W though...***

The monitor runs from 12V DC, drawing only 375mA maximum (4.5W). Its PCB has quite a few preset pots, used to adjust image size and geometry, and also features a six-pin SIL connector which is used to connect to off-board brightness and contrast pots.

So despite its small size and off-beat construction, it's a complete little B&W video monitor; all you need to do is connect it up to 12V DC and feed it with composite video. This means that if you prefer, it too could be used with a CCD camera (either EIA or CCIR) and a couple of IR illuminators for night vision experiments — as well as for general-purpose video work. In fact if you use this monitor you won't need the external sync separator circuit that's needed for the LCD monitor.

***This is the sort of battery you are going to need to make a protable unit – the night vision scope draws around 2.2A.***

## Trying them out

I tried out Oatley's experimental prototype CCD Night Vision unit as shown, and it gave a very good account of itself even in complete darkness. The two 80-LED IR illuminators gave more than enough illumination for clear images at distances of 25-30m or so, and were really 'too much' for indoor use. I suspect that for a practical unit, you'd want to have a switching system so that you could vary the number of LEDs in use, for different levels of IR light output (and to conserve battery drain).

I think I'd try to separate the CCD camera a bit further from the illuminators, too, because at present when you try to adjust the camera lens' focussing, your fingers and hand reflect so much IR back into the lens so that the image tends to 'wash out' — making focussing a bit tricky. Perhaps you could use a 'vertical' format, with the LED arrays at the top and the CCD camera at the bottom...

Overall, though, this approach to low-cost DIY Night Vision seems a very interesting and effective one, and well worth considering.

You could build up this unit for around $250, which is about half the price of a comparable image-intensifier tube system. Oatley is currently selling the LCD monitor module for $70, the matching EIA-format CCD camera module for $89, the little sync separator/power supply board kit for $12, the 80-LED IR illuminator kits for $30 each and the 12V/7A-h battery for $25. So you could save money, for example, by only using one LED array.

I was also able to try out the flat-CRT video monitor, feeding it with composite video from a pattern generator and DVD player (both PAL), and also a Laserdisc player (NTSC). In each case the picture was very bright and clean, and although the circle test pattern was initially slightly egg-shaped, I was able to achieve quite good linearity using the various presets on the PCB.

As a very compact general-purpose 100mm (4") B&W video monitor it therefore seems a nice little performer, and at Oatley's quoted price of $149 it's also quite good value for money.

Needless to say it should also be quite suitable as a monitor for use with a CCD camera for night vision, instead of the LCD unit. You could use it with either CCIR or EIA format cameras, and as it's already designed to accept composite video and for operation from 12V DC, you wouldn't need the little sync separator/power supply board.

One way and another, then, these new products from Oatley should be of great interest to experimenters — especially those who'd like to try a 'different' way of approaching electronic night vision. ❖

# $10 Wonders

## 34 Electronic Candle

**This must be the simplest circuit ever published but, in spite of its simplicity, it neatly illustrates an important electronic principle. It's also fun!**

It all started when we heard rumours that the Y2K bug might make power stations fail at midnight on 31 December. So we decided to lay in a stock of good old-fashioned white wax candles — plus some matches of course. Then we thought of getting a couple more electric torches. And finally we combined the two into the Electronic Candle.

The light comes from an ordinary torch globe but the difference is that, instead of pressing a button to turn it on, you strike a match and hold it near the globe. The globe lights and (here is the candle-like feature) it stays lit when you take the match away. To turn the globe off you either blow it or snuff it out, just as you do for a candle.

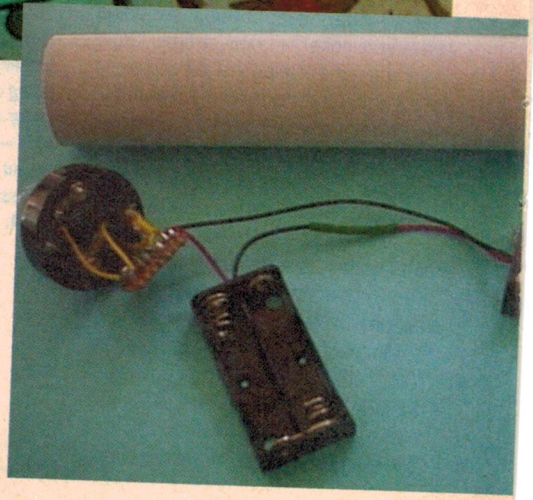
Like a candle, this circuit is intended for use when room lighting is dim. Under these conditions, it does not turn on of its own accord. However, it will respond to light from sources other than a match. You can turn it on simply by flashing a torch or other bright light at it.

### How it works

The circuit (Fig.1) shows that the globe LP1 is switched on and off by an NPN transistor Q1. The amount of base current flowing to the transistor depends on the resistance of R1 which is a light-dependent resistor (LDR). An LDR is made of a semiconductor material that is sensitive to light. When light falls on this material, it provides energy to make some of the electrons escape from the atoms of the semiconductor. These electrons wander freely in the space between the atoms and are then available to conduct electric charge. In short, light produces charge conductors in the material increasing its conductivity. To put it a bit more simply, the material's resistance decreases when light shines on it.

Under low light conditions, the resistance of the LDR (R1 in the circuit) is several hundred kilohms, and so only a small current (10uA or less) can flow into the base of Q1. When R1 is illuminated by a burning match, or bright room lighting, or by the light from a nearby torch globe, its resistance falls dramatically to only a few hundred ohms and the current increases to several milliamps. Indeed, we need the series resistor R2 to limit the base current to a safe level. When base current is small (in dim light) the collector current is too small to light the globe. When the resistance of R1 falls and the base current increases, collector current increases and the globe lights.

Now comes the crafty bit. If R1 is positioned to receive some of the light from the globe, we have feedback. The light from the globe keeps the resistance of R1 low. We can take away the match and LP1 stays lit. This type of



feedback is known as positive feedback. It reinforces the action that caused it.

A similar example is the dreadful screeching or booming you sometimes get from a public address system. A small noise is picked up by the microphone, amplified, sent out by the speakers, picked up again by the microphone, amplified again and so on round and round the system getting louder each time. Once started, it does not stop. One cure is to break the feedback loop by putting a hand over the microphone (and turn down the volume before taking the hand away). Similarly, the electric candle is turned off by breaking the loop. We suggest two ways:

Blow it — a small rectangle of thin black card is mounted on the LDR so that it flips up to cover the LDR when we blow.

Snuff it — put your fingers around the globe (careful! — it could be hot like a candle flame) to block the light getting to the LDR.

Either technique stops the light from reaching the LDR for an instant. In that time the resistance of the LDR increases, the base current decreases, the collector current decreases and the globe goes out. The feedback loop has been broken and restored, changing the state of the circuit.

## Construction

Various kinds of enclosure can be used but probably the easiest and cheapest is a piece of PVC pipe 30mm diameter internally and about 15cm long. Get a scrap from a friend or from the plumbing section of your nearest DIY store. The globe holder has a base about 34mm diameter, very close to the external diameter of the pipe.

After you have completed and tested the circuit, it is an easy matter to hold the socket against one end of the pipe and wrap insulating tape around them. You remove the tape and extract the circuit whenever you need to change the cells. The pipe is broad enough to balance securely when stood on end so there is no need to seal its lower end. However, you may like to enhance the illusion by making up a fancy candlestick to hold it.

Our prototype is powered from four size AAA cells contained in two battery holders. This power pack is of the right size and shape to fit into the pipe. We had considered using a 9V PP3 clock battery, but it is not easy to get 9V globes and to use a 6.3V globe would mean wiring in a fairly hefty dropper resistor. If you prefer it, you could make a chunky candle from a short length of drainpipe, and this would have room for four 'C' type or 'D' type cells. These would last longer and be more economical.

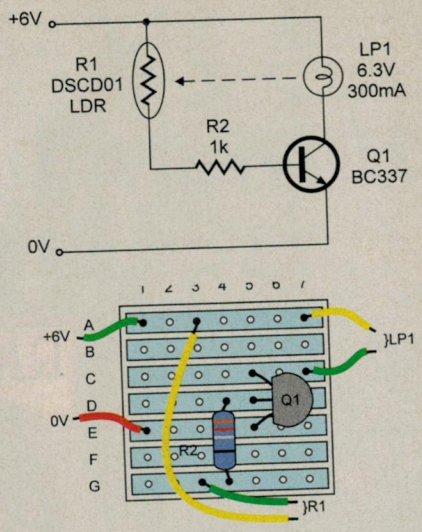
Some globe holders have the terminal bolts tapped directly into lugs attached to the socket. With these you wrap the end of the connecting wires around the bolt and tighten the bolt. Our socket had the bolts going through to nuts under the base. This makes it possible to use solder tags and bolt them beneath the base, which gives a neater appearance. Use flexible multistranded connecting wire of as fine a gauge as you can get. Solder tags tend to oxidise on the surface with age so they may need filing to make them shiny before soldering.

Various designs are possible for the shutter that is to come between the globe and LDR when you blow. We found that a rectangle of thin black card worked quite well. We made two fine holes in this with a pin, about 3.5mm apart, and then threaded the leads of the LDR through these. The photo shows the assembly. When you blow from the left the shutter rises and covers the sensitive face of the LDR.

With the shutter already on the leads of the LDR, solder a short length of fine-gauge multistranded wire to each lead to extend it and to provide a flexible connection to the circuit board.

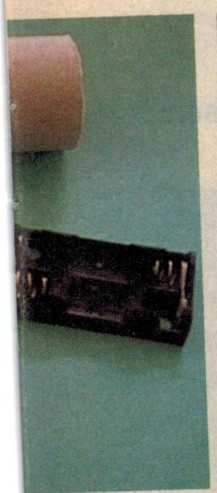
Most globe holders have two holes in the base for bolting the base to a panel. Thread the leads of the LDR through one of these, having covered one or both of the leads with sleeving or insulating tape. You may find that the covered leads fit tightly in the hole, so holding the LDR securely in place.

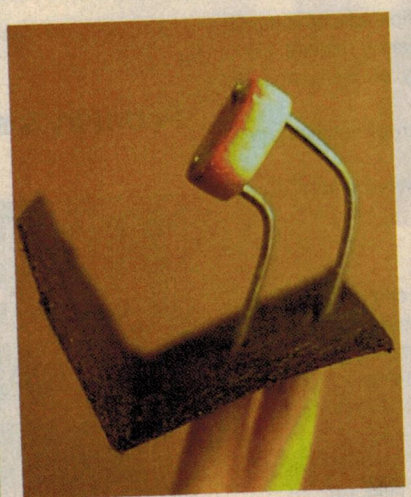
Bend the leads so that the LDR is well illuminated by the globe and that the shutter has space in which to rise and fall. Then make the assembly more secure by running glue between the leads where they pass through the hole in the base of the globe holder. A 2-part epoxy resin glue is best, or use clear UHU or Bostick. If the leads are a loose fit in the hole, wedge a sharpened match or a toothpick alongside them in the hole. Cut off the protruding pieces of match after the glue has set.

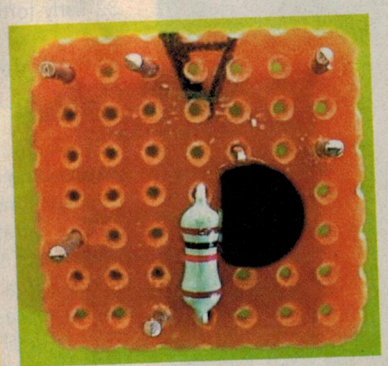



The circuit board is so minimal that there can be no difficulties in building it. Just for once, there are no solder blobs beneath the board and none of the strips need cutting. To minimise the risk of short-circuits stick a square of insulating tape on the under surface after assembly.

Then connect the board to the globe, LDR and battery boxes, making the leads short or long as required to align the items in a row, ready to drop into the pipe. Test the operation of the circuit at this stage. Then insert the circuit into the pipe and wrap insulating tape around the base of the globe holder to seal it to the pipe. You may need to tweak the LDR leads and the shutter to get the mechanism working properly. ❖







## Parts List

### Resistors

R1 LDR type ORP12, DSCD01 or equiv.
R2 1k, 1/4W.

### Semiconductors

Q1 BC337 NPN transistor

### Miscellaneous

LP1 MES filament lamp, 6.3V/300mA MES lamp socket; stripboard 20 x 20 mm (7 strips x 7 holes); 6 x 1mm terminal pins; 2 x twin AAA battery holders (see text); pipe or other enclosure; few cm of plastic sleeving (or use insulation stripped from cable).

**Electronics Australia** is one of the longest-running technical magazines in the world. We started as **Wireless Weekly** in August 1922 and became **Radio and Hobbies in Australia** in April 1939. The title was changed to **Radio, Television and Hobbies** in February 1955 and finally, to **Electronics Australia** in April 1965.
Here are some interesting items from past issues:

# 50 years ago

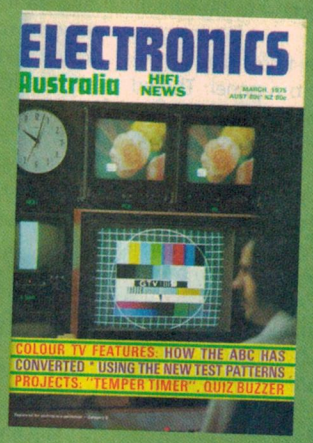
**Latest lens for large television is plastic:** A new thin, flat plastic lens for enlarging the television image on home receivers is the latest accessory for TV fans. It operates on the Fresnel principle of magnification and is known as the magna-screen. Weighing but a few pounds, it is easily attached to any type of receiver by means of brackets supplied with the lens.

It is adjustable and can be quickly changed to give any desired degree of magnification within its scope. The magna-screen is free from edge distortion and provides glareless viewing of the image at a reasonably wide angle.

The lens operates on a principle similar to the Fresnel lens used in lighthouses. its magnifying power is based on the fact that carefully designed optical prisms or ridges are impressed in the plastic from a master die, each prismatic line corresponding to a segment of the curved surface of a thick glass lens of the usual type.

# ...25 years ago

**New digital watch has seconds readout:** Recently released onto the Australian market by Deltatron Microsystems Corporation, Carson, California, is a new digital watch featuring a liquid crystal display and a unique seconds readout.

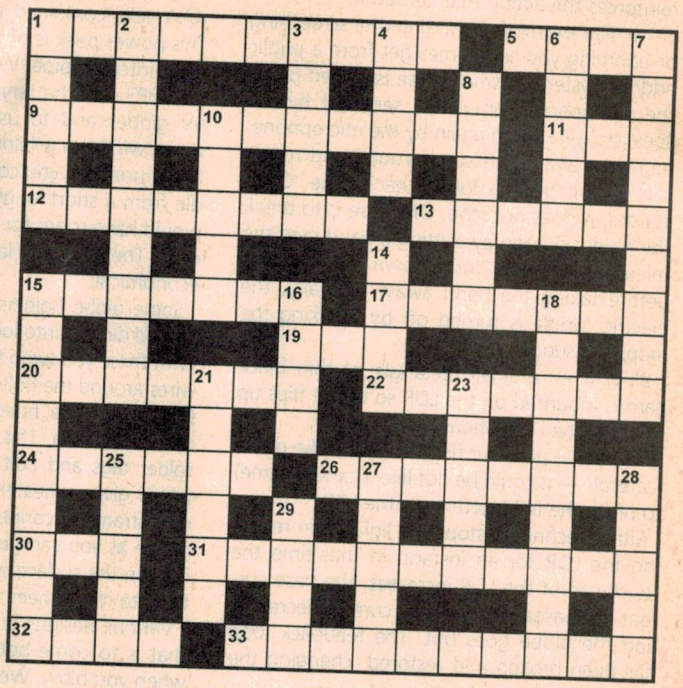



Designated the "Delta", the new watch is fully solid state and has no moving parts. It is timed by a 32,768Hz quartz crystal oscillator operating in conjunction with a single CMOS integrated circuit which performs the required frequency divisions. Accuracy is claimed by the manufacturer to be plus or minus 5 seconds a month.

The liquid crystal display provides good readability in all light conditions, including direct sunshine, whilst minimising current consumption. The unit is powered by a miniature silver oxide battery which has a life expectancy of one year.

Setting the watch to the correct time is accomplished by simply activating two of the three external buttons. These allow the time to be set to the nearest second. The third button is used for displaying the seconds mode. When this button is depressed, the hours and minutes are cleared, so that only the seconds are displayed. Depressing the button again returns the display to the hours and minutes mode. ❖

# Crossword



## ACROSS

1 A tenth of 2000. (3,7)
5 Group of parts working together. (4)
9 Regular in form. (11)
11 European standard. (3)
12 Charged equivalent of a magnet. (8)
13 Said of small TV antenna. (6)
15 Superior in style. (7)
17 Such is a modern disc. (7)
19 Standard for film speed. (1,1,1)
20 Replace available items. (7)
22 Jotter. (7)
24 Lifts. (6)
26 Making fine adjustments. (8)
30 Metal-bearing mineral. (3)
31 Speciality of this magazine. (11)
32 Early form of voltaic battery. (4)
33 Puzzling word grids. (10)

## DOWN

1 Sense. (5)
2 Measuring devices. (9)
3 Funereal music. (5)
4 Make surface image. (4)
6 Section of TV set circuit. (5)
7 Produced a current etc. (9)
8 Filled space. (6)
10 Additional cast member. (5)
14 Traverse a field. (4)
15 Source of hum. (5,4)
16 A short period of video camera use. (4)
18 Part of a hifi system. (9)
21 Source of power or signal. (6)
23 Pace of rhythm. (5)
25 Perfect (as 28 may be treated). (5)
27 Costs scale for telecoms users. (5)
28 Argon, krypton, neon, and so on. (5)
29 Screening system: ....projection. (4)

## February's solution:

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | U | L | L | W | A | V | E | | M | E | S | F | E | T |
| A | | I | | I | O | | I | D | | O | | I | | |
| U | N | M | O | D | U | L | A | T | E | D | | R | O | M |
| L | | I | | E | | U | | E | | Y | | M | | E |
| T | O | T | E | | E | M | E | R | Y | | J | U | N | C |
| S | | E | | K | | E | | A | | S | | L | | O |
| | P | R | I | N | T | | S | T | O | P | B | A | N | D |
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| H | I | G | H | B | A | N | D | | C | U | R | I | E | |
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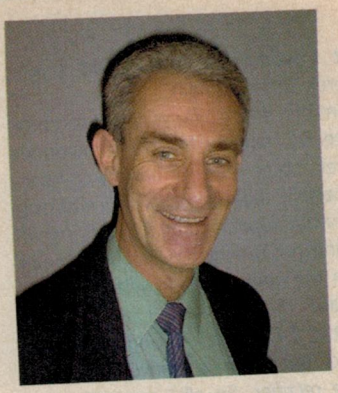
# Y2K humbug?

## Peter also takes on a bedlight sound trigger, WAV files over the phone and more



**by Peter Philips**

Most of our topics this month are questions from readers: like where's the diodes in this battery eliminator, how can a 60Hz motor driven clock be operated from a 50Hz supply, what causes hum in a valve amplifier and so on. There's also more on interfacing a CD player to the microphone input of an amplifier, and we start with a few questions about the Y2K business.

You might remember that *EA* editor Graham Cattley made a prediction about the Y2K bug in his editorial for the January issue. He said nothing would happen. And so far it would appear he's right. But surely not! There must have been something left uncovered by the army of programmers who made sure our money was safe and that planes wouldn't fall out of the sky. I've only heard of one effect, in which the boom gates in a particular car park in Sydney refused to recognise valid entry cards, causing frustration to the few people game enough to use their car on New Years Eve.

So I thought I'd ask readers to send me details of anything that can be attributed to the Y2K bug. As far as I'm aware (in early January) nothing major seems to have happened, although there are other critical dates yet to come, such as the 100th day of the year. But then, perhaps the vast amount of money spent on preventing potential Y2K disasters has paid off. Thank you programmers, your time certainly came in 1999, and you rose to the challenge. Anyone with a knowledge of computer programming could tell the Y2K thing was very real, and it's rather alarming to hear media people now suggesting otherwise.

So if you know of any Y2K effects, let me know and I'll present them in a future issue. I'd also like to hear from programmers with a story to tell, such as finding code that if left uncorrected would have spelt disaster. Just how close did we come? Was it really necessary to spend billions of dollars on the problem? Did the authorities have to shut down the Sydney rail network on New Years Eve? Was it necessary for hospitals to install standby power generators and to operate in disaster mode during the critical period? Or was it all Y2K humbug, as reported in a local rag?

Now to our reader letters, starting with a letter that asks about interfacing a sound file from a computer to a telephone.

### Soundblaster-phone interface

*I have spoken to 15 people to date who are all in the electronics or communications industry, and not one has been able to answer what I, at first, thought to be a very simple question. I need to be able to play a two minute sound file on my computer to prospective clients while I'm taking them through a 10 to 15 minute interview over the phone.*

*I see no difference between the sound coming out of the line-out socket of my computer's sound card to that of a head phone socket on a portable stereo. I have tried using a small electronic box from Dick Smith Electronics, called a line isolation transformer (LIT), which is designed to give 'radio on-hold' capability to Commander phone systems (read PABX required).*

*Needless to say, this gismo didn't work. Each time I plugged it in (via a standard Telstra double adaptor) my phone went dead (no dial tone), with no audio from the sound card either. I'm told this was possibly due to the LIT draining the power out of the phone line. This is the sort of thing I was hoping to be able to use, or at least something similar.*

*I'm convinced it must be possible, as I simply want to send audio down a phone line while I'm on the phone. Surely it can't be that hard?* (Brian Hancock, email)

I spoke with a few people about your question Brian, and all I can suggest is to couple the sound acoustically. That is, feed the sound from your computer to a small power amplifier and place the speaker so it's acoustically coupled to your phone's microphone.

This seems a simple problem, but mixing two audio sources (you speaking into the phone plus the external recording) cannot be done with a simple line isolation transformer. Electrically speaking, you need to be able to combine the two signals, then feed the result down the phone line. If you could disassemble the phone and add an external mixer (output of phone microphone and output of sound card), you'd then be able to feed the combined signal to the rest of the phone's electronics for subsequent transmission. But this is a rather difficult option, let alone messy.

Acoustic coupling is also somewhat inconvenient, but other than redesigning your phone, I don't know of any other way. Perhaps readers might have some ideas.

### Diode-less battery eliminator

Here's an interesting discovery, a battery eliminator without diodes...

*I have a battery eliminator that has failed, and I have taken it apart out of curiosity. However I can find no sign of a diode, instead it appears to be just a normal step-down transformer. There obviously must be some means of converting the input AC to DC but I can't find it. Pardon my ignorance,*

*but I won't find out unless I ask.* (Derek Logan, email)

Hmmm. There's no way you can produce DC directly from a transformer Derek. Some types of battery chargers (especially those for alkaline cells) output what appears to be AC, but in reality the positive half cycles are greater than the negative half cycles. This still requires diodes however, and gives a positive DC value, although less than you'd get from a conventional full wave rectifier. So all I can suggest is that the manufacturer has built the diodes into the transformer, or has hidden them rather well. *(Perhaps inside the device being charged? — Ed)*

I recall a battery charger my father owned which had a Tungar rectifier — a type of diode valve, but very large. It used to produce a blue glow while operating, and seemed indestructible. It foxed quite a few people who though the valve was simply a way of indicating that the charger was working. So Derek, perhaps you might keep looking, as there must be some way to convert the AC to DC.

## 60Hz clock problem

The next letter is from a reader who has a rather interesting motor-driven clock. Unfortunately it's for 60Hz.

*I'm wondering if you can provide an electronic rather than an electrical or mechanical solution for a clock. I've recently purchased a vintage Golden Hour mystery clock — it has a motor in the base which drives a glass disc to which the minute hand is attached. The minute hand glass disc has a gear on its circumference, which is concealed by the clock's rim. The hour hand is driven by a counterweight attached to the rotating disc via a gear train. It looks as if there are no clockworks, hence the mystery. It's a neat and interesting timekeeper.*

*These were made in some numbers in the USA up until about 25 years ago and were therefore 110V 60Hz, 2.5 watts. No problem about using a stepdown transformer, but how to provide 60Hz? The 'mystery' side of the works, plus the fact that the base has been cast to accommodate the motor means that swapping the existing motor for a 230V 50Hz type would be difficult, if not impossible.* (John McKean, email)

What you need John is a power source that provides the required 110V at 60Hz. Given that the power requirements are 2.5W, this should not be too difficult, although deriving an accurate 60Hz source could be a problem.

I checked our database for anything that might help, but the only project I could find that is remotely related is one published in July 1976, called a 50Hz Clock Driver. I don't have access to this issue, so I can't tell you what the project does, or how it derives the 50Hz. Still, it might give you some ideas.

In principle you need an accurate 60Hz sinewave oscillator connected to a 5W or so power amplifier. The output of the amplifier could then be stepped up to 110V with a suitable transformer to drive the clock. If you don't require crystal-based accuracy, a Wien bridge oscillator or even a 555 timer with quality timing components would do the job.

Otherwise use a frequency divider supplied by a higher frequency crystal to derive a 60Hz signal. This will give a square wave output, but the motor probably won't mind. Or you might look at buying a 12V DC to 110V 60Hz converter from the USA, assuming the 60Hz frequency it generates is accurate.

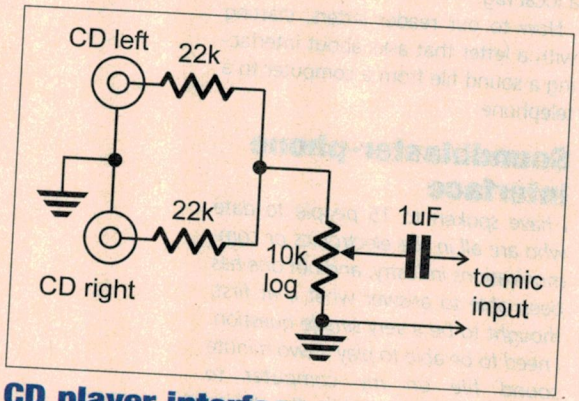



**Fig.1: Interface for a stereo CD player to a mono electret microphone input of an amplifier.**

## CD player interface

In the November column, in response to a letter from a reader (D. Pearson, Berwick, Vic) I described a way of interfacing a CD player to the microphone input of an amplifier. The following letter suggests a few improvements to my interface circuit.

*I feel your answer about interfacing a CD player to the microphone input of a receiver was inadequate. First of all, as the reader seems to have limited technical knowledge, you might have misled him by specifying a 47k potentiometer, which as you know, he'll find impossible to obtain. The value should of course be 50k.*

*Secondly, you have specified a linear potentiometer. You mentioned that the voltage needs to be reduced by about 100 times or 40dB. With this amount of attenuation, the control will be almost fully anti-clockwise, and therefore extremely difficult to adjust. The situation will be even worse due to the use of a linear potentiometer. For this reason it would be much better to specify a logarithmic type.*

*A third point concerns the single input socket. I am not aware of any mono CD players on the market, so it would obviously be necessary to arrange for two input sockets, resistively mixed together to sum the left and right inputs for the mono microphone input. At the same time, the mixing loss could usefully relieve the need for the large amount of attenuation provided by the potentiometer.*

*A fourth point concerns the 0.1uF capacitor in series with the microphone input socket. The impedance of an electret microphone input is quite low, typically a few thousand ohms. For example, Jaycar specifies a load resistor of between 300 and 4700 ohms for the AM4010 electret microphone, which effectively becomes the input impedance of the microphone channel. Assuming a 4.7k impedance, a series capacitor of 0.1uF would cause an attenuation of some 20dB at 30Hz. A 1uF capacitor would solve this problem.*

*My suggested design for an attenuator circuit is attached, which overcomes the shortcomings described above.* (Neil McCrae, East Hawthorn, Vic)

Thanks for your comments Neil. Certainly I should have recommended a 50k pot, rather than a 47k, and I agree a logarithmic type would give better control. However, I did say the control could be difficult, and suggested adding a resistor in series with the pot, with a value chosen to give the best control.

Regarding the stereo into mono aspect, I didn't address this, as based on my experience with Philips equipment, I thought it possible that the amplifier might have a stereo mic input. However, the chances are it doesn't, so your mixer idea gets around this.

The input impedance of the mic input socket could be as you say Neil, although in my experience, this value is usually more than 4.7k. However I take your point that a higher value coupling capacitor would allow for virtually any input impedance.

Neil's circuit is shown in Fig.1. I hope

Mr Pearson is reading this to get the benefits of two people developing a circuit in their heads, but without actually testing it.

## Sound trigger for bed light

Projects from our $10 Wonders section often get a mention here, as quite a lot of readers want to extend the application of these simple projects. Here's an example:

*I was wondering if the sound operated trigger presented in the March 1999 edition could be used to switch a 240V bedside lamp. If so, which components would I need to change?* (T. May, Myrtle Bank, SA)

It's not just a matter of changing components Mr May. Instead you'll need an additional relay and a suitable driver circuit if you want use this project to switch a 240V appliance, such as a bedside lamp. The trigger, as presented, is simply that: a trigger, in that it provides a trigger pulse to a timer which forms part of the circuit for the light it's supposed to drive.

So, you'd also need to build the Novelty Nightlight in the February issue (page 50), and replace one of the 6V lamps with a suitable relay. However, it would be difficult to find a 6V relay capable of switching a 240V load, so you would also need to operate the circuit from a 12V supply. This allows you to use a 12V relay, with contacts rated at 240V.

However Mr May, please don't get into 240V wiring unless you are suitably qualified. It's very easy to get it wrong, and I'd hate to lose you as a reader.

## Hum in a valve amp

Here's a letter asking for advice on curing hum. It's in a valve amplifier though:

*Back in September 1996 you presented a project called a Valve Sound Pre-amp. I recently bought a kit and built it. Unfortunately, while it works fine in all other respects, it's putting out a lot of hum. What am I doing wrong?* (Labros, by fax)

Hum can occur for a number of reasons in a valve amp Labros. Unshielded input leads are one culprit, mainly because of the relatively high input impedance of a typical valve amplifier. However in this case, the input impedance is around 50k, so this is not a likely cause. Another common reason is hum on the supply line, but unless you've done something very wrong, I doubt this to be the cause, as the circuit has a lot of filter capacitors by virtue of its voltage multiplier.

The last reason I can think of is hum due to the valve filaments. Although unlikely to cause a lot of hum, make sure the filament wiring is twisted, as shown in a photo of the project. Finally, perhaps you have a faulty valve, in which the cathode has a full or partial short to the filament. So there's a few things to try. And dare I mention checking whether all components are mounted the right way, especially electrolytic capacitors.

## Video heads and magnetism

Some time ago I included a letter from The Serviceman, who explained why it's not necessary to de-magnetise video heads. The next letter agrees, and takes the topic a bit further.

*I enjoy your column, and I'd like to add to the discussion as to why video heads do not need to be demagnetised. Apart from that which The Serviceman has mentioned already, the material of the heads plays an important role in preventing residual magnetism. The material is typically a ferric oxide mixed with oxides of other metals such as zinc, magnesium and nickel. Ferrite heads are more efficient at high frequencies than those made from other materials, and are therefore ideal for video record/playback.* (Paul Hetrelezis, email)

The material used in a video head is clearly an important part of the design, which as you say Paul, by its very nature is not easily magnetised. I guess however the important thing to restate is that it's not necessary to demagnetise video heads.

## What??

The question I've got for you this month comes from a currently used electrical trades text book — *Electrical Principles for the Electrical Trades* by JR Jenneson. The question comes from the self-testing problems for the second chapter, and would typically be attempted by first year students after a few weeks of tuition. Jenneson asks:

*An electric urn raises the temperature of 12 litres of water from 15°C to 60°C in 25 minutes. With a supply voltage of 240V, calculate the current taken from the supply, assuming there are no heat losses.*

Yes, you'll need more information to solve the problem, but you won't find it in Jenneson. So, if stage one trade students are expected to be able to do the question, it should be a breeze for *EA* readers.

## Answer to February

There are three resistors with values of 5, 10 and 49 ohms, and John is 32 years old. To solve the problem, break 2450 into its prime factors, then combine them in all possible ways until one combination meets the other known facts. The factors are 2 x 5 x 5 x 7 x 7. The sum of the resistor values must be an even number (twice Fred's age), and their product equal to 2450. From this, you'll find that all possible values for two resistors that have a product of 2450 give a sum that is an odd number. The same applies for four resistors.

For three resistors, there are nine possible values that sum to an even number (shown in brackets) and whose product is 2450: 2, 25, 49 (76); 2, 35, 35 (72); 5, 10, 49 (64); 7, 10, 35 (52); 5, 14, 35 (54); 7, 14, 25 (46); 7, 7, 50 (64); 5, 7, 70 (82) and 5, 5, 98 (108). There's only one possible combination for five resistors: 2, 5, 5, 7, 7, which also sums to an even number (26).

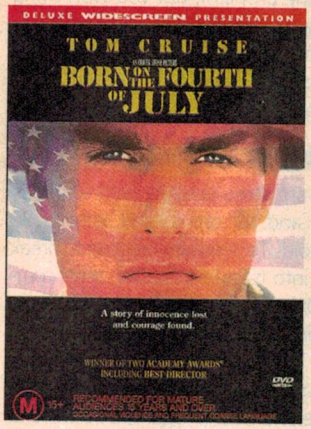
However, the only possible combinations are those that give the same sum (64), as Fred sought further information before answering the question. As the smallest value resistor has a 1% tolerance, the combination of 7, 7, 50 is not allowed, as there are two smallest value resistors, so the other combination totalling 64 is the answer. ❖


**Record Keystrokes on PC in hardware**

*Record keystrokes in hardware with tiny device.* Looks exactly like a keyboard extension cable. Simple to use, as easy as plugging it in. Embedded micro and flash memory are invisible inside the plug. Keystrokes can be retrieved on any PC.

**WWW.KEYGHOST.COM**

## BORN ON THE FOURTH OF JULY




**Universal, 1989. Directed by Oliver Stone, with Tom Cruise, Willem Dafoe, Kyra Sedgwick. Widescreen, colour, 138 minutes. SS/DL disc, Dolby Digital 5.1 surround. Columbia TriStar Home Video, M15+; $34.95.**

This harrowing movie was based on the life story of US Vietnam war veteran Ron Kovic, and directed by fellow Vietnam vet Oliver Stone. Tom Cruise plays Kovic, who goes off to war a young all-American hero but comes back a paraplegic with a shattered personality — to an American society which has lost its moral confidence and now finds him an embarrassment. Cruise injects the role with great depth, and Stone uses his experiences to mirror the way Vietnam triggered a crumbling of US self confidence. Powerful stuff, and it won an Academy Award.

The picture quality on this DVD is good, although there's a bit of ringing visible around high-contrast edges, and also some side-to-side jitter on the titles and first few scenes. The main 5.1-channel sound track is fine, though, and there's also four three-channel tracks with German/French/Italian/Spanish, and mono tracks for Polish and Czech.

There isn't a great deal in the way of bonus features, though: the trailer, some production notes and notes on the cast and film makers. Basically you'll be going for this one to experience the movie itself.

It's certainly not for the faint hearted, but if you brace yourself it makes unforgettable viewing. (J.R.)

**Picture:** ★★★★½
**Sound:** ★★★★★
**Movie:** ★★★★★
**Bonus Extras:** ★★★½★

## THE ADVENTURES OF BARON MUNCHAUSEN

**Columbia, 1988. Directed by Terry Gilliam, with John Neville, Eric Idle, Sarah Polley, Uma Thurman and Oliver Reed. Widescreen, colour, 121m. SS/SL disc, Dolby Digital stereo; Columbia TriStar Home Video, PG; $34.95.**

In the hands of Terry Gilliam, the classic tale of teutonic hero Baron Munchausen and his over-the-top fantasy exploits has some excellent special effects, and cameo roles by all kinds of actors — including Jonathan Pryce, Sting and an incognito Robin Williams as the loony 'King of the Moon'. It also won about four Academy Award nominations, and as a Monty Python fan I expected to enjoy it immensely. Instead I found it strangely hollow and disappointing.

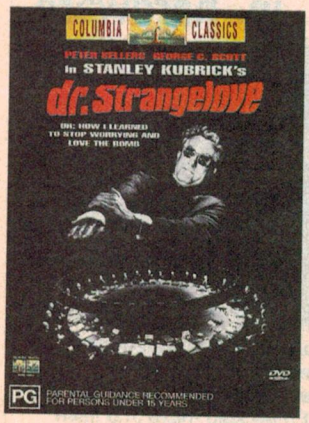
The picture quality on this Sony Gold Standard transfer is very good indeed, for the movie itself, with crisp detail and rich colour. And although the sound is only in stereo (except for the German track, which alone has an extra rear surround channel!), it's also clean and nicely balanced.

There's not much in the way of bonus extras. You get just the original US trailer, albeit with a surprising amount of picture smearing, and filmographies of Gilliam, Idle, Neville and Thurman; that's it.

You might be disappointed, then, if you're expecting another Pythonesque bucket of laughs. But it's still well worth a look. (J.R.)

**Picture:** ★★★★½
**Sound:** ★★½★★
**Movie:** ★★★½★
**Bonus Extras:** ★★½★★

## DR STRANGELOVE




**Columbia, 1963. Directed by Stanley Kubrick, with Peter Sellers, George C. Scott, Sterling Hayden and Slim Pickens. Full screen; B&W, 90m. SS/SL disc, Dolby Digital mono; Columbia TriStar Home Video, PG; $34.95.**

Although the cold war has long since ended (at least officially) and 37 years have passed since it first appeared, this classic Kubrick/Sellers 'black comedy' on gung-ho militarism still retains most of its appeal. Sellers really shines in his trio of roles (British air force officer, US President and loony ex-nazi scientist), and Scott is terrific as the original "never mind Mr President, let's nuke 'em anyway!" military advisor. The scene of pilot Pickens hollering with pride as rides the nuclear bomb down towards its Soviet target is still as memorable as ever, too.

The original was only in B&W and with a mono sound track, but Sony's Gold Standard techies have done a pretty good job of transferring it to DVD. The picture is very clean, and although the highlights are a tad harsh and 'burnt out', this actually adds to the 'pseudo documentary' realism. The sound is much the same, and I suspect the distortion we hear at times was introduced by Kubrick deliberately, to heighten the impact.

Columbia TriStar's DVD people seem to have had quite a job raking up much in the way of bonus features, after all this time, but they've clearly done their best. There's the original trailer, filmographies of Kubrick and the main players, stills of some posters for the film, and also some stills taken during the original production. It's better than nothing.

Overall, though, you could hardly get a better viewing copy of this absolute classic 'how I learned to stop worrying and love the bomb' satire. (J.R.)

**Picture:** ★★★½★
**Sound:** ★★★½★
**Movie:** ★★★★★
**Bonus Extras:** ★★½★★

# Book reviews

## Electronic design and the environment

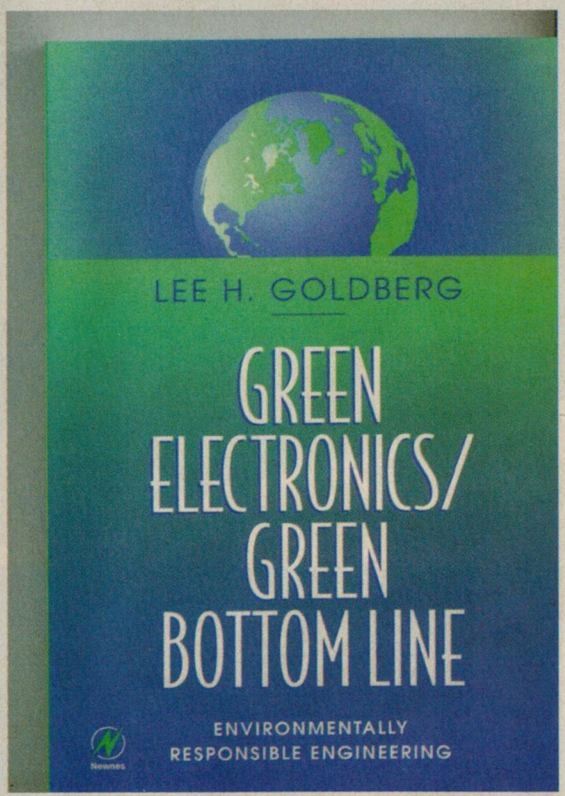
**GREEN ELECTRONICS/GREEN BOTTOM LINE, by Lee H. Golberg. Published by Butterworth Heinemann, 2000. Soft cover, 153 x 233mm, 340 pages. ISBN 0-7506-9993-0. Recommended retail price $89.95.**

According to the back cover copy, this book "offers practical advice for engineers who want to incorporate environmental issues into the design process. The emerging discipline of Design for the Environment (DfE) combines engineering know-how with environmental awareness. Topics include international policy issues such as ISO 14000, materials selection (eg, for recylcability), manufacturing concerns like no-flux processes, and design issues such as power consumption..."

In other words folks, this a book about making your designs environmentally friendly, which means making them efficient (less gases up the power station spout), using recylcable materials, all that sort of thing.

No one would argue the sentiment behind this book, and many would welcome such a book. But books written in the name of the environment can sometimes be a bit too warm, fuzzy and chatty, leaving the reader wondering what the point is. The author's preface is an example, reading more like a potted history of his life, with a few anecdotes about his new baby daughter. But fortunately the author didn't really write the book. Instead each chapter is written by a different team (or individual), with the author either as interviewer, or simply as editor.

As a result, if you can get past the preface, you'll hit the 'nitty gritty'.

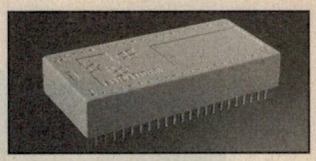



Here you'll read about such things as making the pipes larger and pumps smaller to get better efficiency (read environmentally friendly), or why it's better to use a microcontroller in a motor drive circuit. To be honest, there's a lot of good information in the book, but whether it's really environmentally related or simply a restatement of what most engineers learn during their training years is difficult to say.

It will look the part on your bookshelf though, and might give you ideas on how to make an electronic design that bit more efficient or environmentally friendly. Just be prepared to wade through stuff you probably already know. The review copy came from Butterworth Heinemann, PO Box 251, Port Melbourne 3207. (P.P.) ❖


# THE TIGER COMES TO AUSTRALIA

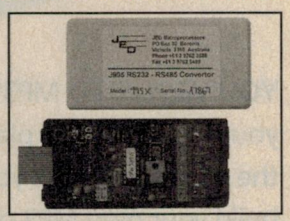
**You've seen the BASIC Tiger and Tiny Tiger advertised in the US magazines: they are now available in Australia from JED.**



Tigers are modules running true complied (not tokenised), Multitasking BASIC at 20 Mhz, but only draw 45mA. They have memory, 4 x 10-bit analog inputs, digital I/O, two serial ports, RTC, and are superb small controllers for scientific and industrial applications. **A Tiger with 128kB FLASH, 128kB CMOS RAM and RT clock costs only $162.** A development system (W95/98/NT), with a proto board, is only $275. JED has a local board/controller with LCD/Kbd and industrial I/O.

See our www site or call for data sheets.

## RS232 to RS485 Converter



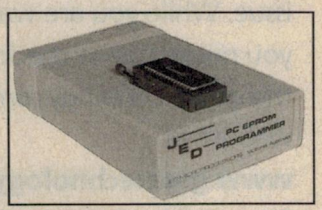
The small plastic case 100mm by 55mm by 25mm is an Australian-built RS232 to RS485 optoisolated converter. It connects a PC or PLC RS232 serial port to a multidrop RS485 differential cable up to 4,000 ft long.

**The J995X converter has an internal microprocessor to automatically connect the transmitter to line, so the user program need not use the RTS line for RS485 TX control.**

**Cost $160 plus $20 plug pack.**

## $300 PC-PROM Programmer
## Also: Chiprase Eraser $225.

This programmer plugs into a PC printer port and reads, writes and edits any 28 - pin or 32 pin PROM without needing special plug-in cards.



**JED Microprocessors Pty Ltd**
**www.jedmicro.com.au**
**173 Boronia Road, Boronia, 3155**
**Ph 03 9762 3588**
**Fax 03 9762 5499**
(prices do not include freight,sales tax or gst)

# The Music2Go MP3 Jukebox

YOU'VE PLAYED MP3's on your PC, seen MP3 players in the shops, and now you can build your own MP3 player! Electronics Australia in association with gigatechnology.com proudly present what we believe to be the first ever MP3 construction project.

Stay tuned for all the details of this amazing project, appearing in an upcoming issue. While you are waiting, you might like to check out the gigatechnology.com website at **www.gigatechnology.com** for a sneak preview...

## Specifications

| | |
|---|---|
| **Power:** | 12VAC @ 1A or 15VDC @ 1A using 3.5" Drive |
| | 8-15V@800mA AC or DC using 2.5" Drive (Recommended for car use) |
| **Controls:** | Play, Stop, Rew, Fwd, Menu and Dial Controller |
| **Audio:** | S/N >90dB |
| | THD <0.01% |
| **Outputs:** | Headphones at 10mW/channel |
| | Stereo RCA sockets at line level |
| **Input:** | PC Parallel port data link. |
| | Serial port control link. |
| **Playback Modes:** | Normal, Random, Repeat one/all, Intro scan |
| **Track Selection:** | Playlist, Album, Artist, Genre |
| **Search Modes:** | Track name, Artist Name, Album Name, Playlist Name, Track Number |

## Features

- ❑ Stores 100's or even 1000's of music files
- ❑ Uses a standard IDE hard drive
- ❑ Plays all MP3 files (8kb/s - 340kb/s) and variable bit-rate (VBR).
- ❑ Allows you to program your own playlists
- ❑ Back-lit 2x16 character LCD screen shows track name and other information
- ❑ Volume, bass and treble controls
- ❑ Portable, can be installed in your car (2.5" Hard Drive Recommended)
- ❑ Fast track selection with easy to use dial controller
- ❑ Keep all your music in one place (put your CDs someplace safe)
- ❑ Firmware upgradable over the Internet
- ❑ Handles up to 65,000 tracks
- ❑ Serial port allows for remote control (watch for later add-ons)

## Hubble reopens eye on the universe

NASA's Hubble Space Telescope is back in business, as made dramatically evident in stunning new pictures taken during January 2000, as part of the activities to recommission the earth-orbiting telescope. The pictures are a culmination of the successful Space Shuttle servicing mission (STS-103) last December, which restored NASA's premier optical space observatory to full capability beefed-up with new electronics and critically needed replacement gyroscopes. Hubble has now resumed probing the Universe's many mysteries with a crystal-clear view.

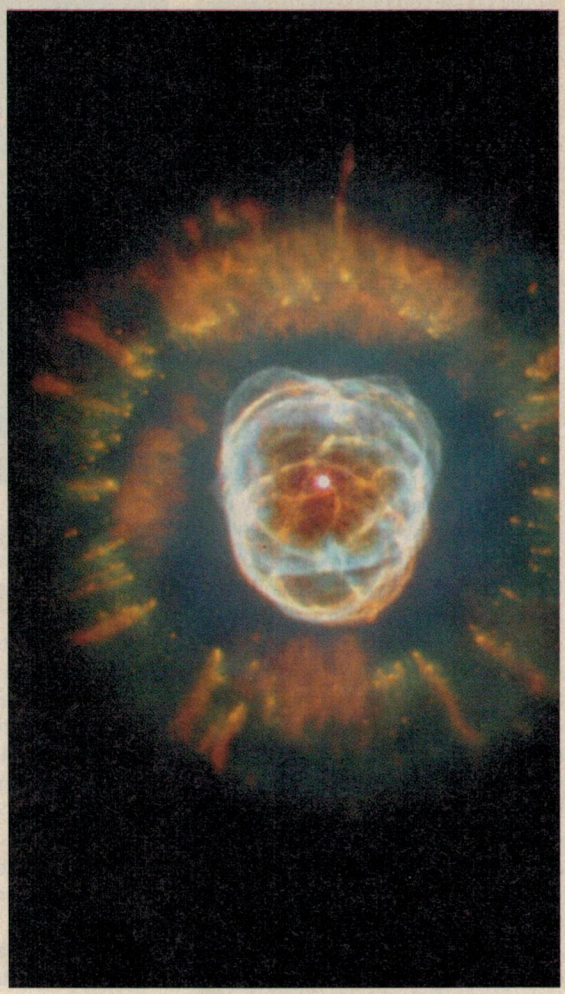
To verify the telescope's refurbishment, astronomers resumed operations by aiming it at scientifically intriguing and photogenic celestial targets. One object is an intricate structure of shells and streamers of gas around a dying sun-like star 5,000 light-years away.

Designated NGC 2392, it is dubbed the 'Eskimo Nebula' because, as seen through ground-based telescopes, it resembles a face inside a furry parka. In Hubble's sharp view, the 'furry' features resemble giant comets all pointing away from the central star, like the spokes of a wheel. "The clumps that form the comet heads all seem to be located at a similar distance from the star. This fact will be important in developing a theory of why the clumps formed in the first place," said planetary nebula expert J. Patrick Harrington of the University of Maryland, College Park, MD. He adds, "Of all the planetary nebulae imaged by the Hubble Space Telescope, this new image is unsurpassed in subtle beauty."

The planetary nebula began forming about 10,000 years ago, when the dying star began flinging material into space. The nebula is composed of two elliptically shaped lobes of matter steaming above and below the dying star. In the photo, one bubble lies in front of the other, obscuring part of the second lobe.

Spacecraft operators report that all the new equipment installed on the telescope in December is working perfectly, including the new computer, solid state recorder, and fine guidance sensor. In particular the new gyroscopes are allowing Hubble to reliably point with exquisite precision at celestial objects.

Two key science instruments, the Wide Field and Planetary Camera 2 and the Space Telescope Imaging Spectrograph, are now being used for routine science observations by astronomers worldwide to probe everything from planets, to black holes, to far flung galaxies.



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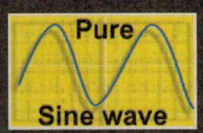


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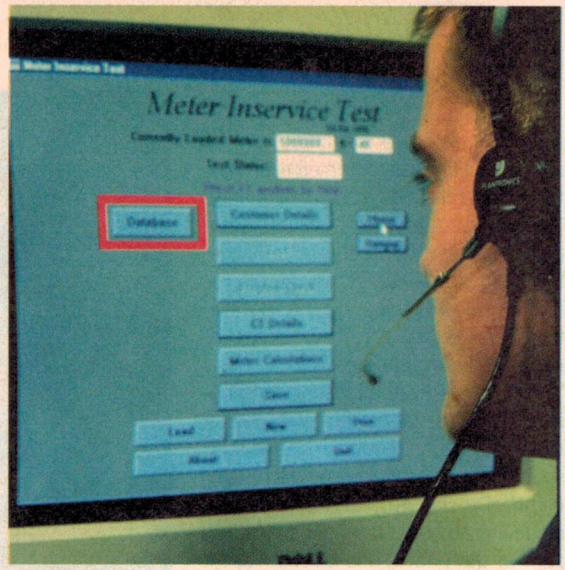
## Mobile phones monitor electricity meters

Mobile phone communications specialists Call Direct Cellular Solutions have revolutionised the manner in which data in Australia and worldwide can be automatically collected from remote and difficult locations, with their cellular phone-based Remote Monitoring Units (RMU). Developed as a more cost and time efficient system for power company Integral Energy to access data directly from electricity meters, the technology used in the RMU's eliminates the previously labour-intensive and often difficult task of collecting individual data from meters, by providing two-way communication.

Remote location reading had been a problem for sometime, both the cost of delivering services and the ability to reach whole areas were issues that manual labour, landlines and radio networks had not been able to adequately address. Commenting on Call Direct's success in developing the Remote Monitoring Units, Mr Eddie Caruana, Project Manager at InfoMet (a subsidiary of Integral Energy) explained, "the essential task of reading customers' meters eventually became a problem. Our readers had to visit premises monthly to obtain consumption details, and apart from the rising cost of labour, there was the inconvenience and security problems associated with gaining access. This inevitably led to additional costs and delays in bill processing."

Mr Michael Ash, Managing Director of the Call Direct Cellular Solutions said, "Integral's InfoMet division can now easily monitor and assess each situation. The RMUs can interface directly with multiple meters, and the built-in software allows the monitor to adapt itself to any kind of meter by automatically configuring to voltages between 85 - 265V. Call Direct's long term relationship with Nokia contributed significantly to providing the solution for multiple meter compatibility. By incorporating Nokia's CardPhone (a PC Card with built-in GSM phone) for use as a transceiver, the RMU is able to interface directly with any electricity meter".

"The signal strength is able to be measured internally, and an LED set indicates the real-time status of a unit's performance. Integral Energy is now able to receive data more quickly, and accurately and other Australian power companies have recognised the benefits, and installed the remote monitoring units."




He went on to say, "We have already installed several thousand units in every state of Australia and we have interest from a diverse range of Australian and international companies and governments. The digital technology is not confined to reading power meters; it can be used areas such as gas, water, SCADA systems, remote switch control, building management control, vending machines, remote plant monitoring, irrigation and other telemetry applications."

Suitable for use in over 140 countries, export has commenced to Ireland, South Africa, New Zealand and India, (a country which has enormous potential for the RMU's). Call Direct have also received interest from Singapore, China, Malaysia, Hong Kong, Romania, England, the Phillipines, North America and Columbia.

## Sharks hate Tektronix

The 'Shark POD' (Protective Oceanic Device) has been making waves in diver protection against sharks, and Tektronix' awarding winning DPO technology is behind the development and improvement of this life saving device.

The Shark POD produces an electrical field around the diver that disrupts the shark's sensitive nervous system, and causes the shark to abruptly swing away. The diver is effectively encased in an invisible cocoon which offers protection for up to seven metres.

"The POD is unique in that it is the only such device on the world market, with thousands of units in use by a wide range of divers, abalone divers, lobster divers, marine biologists, military divers and of course sport divers", said Mike Wescombe-Down, the technical director at Shark Protection, an Australian company that has been distributing and improving on the shark repelling technology.

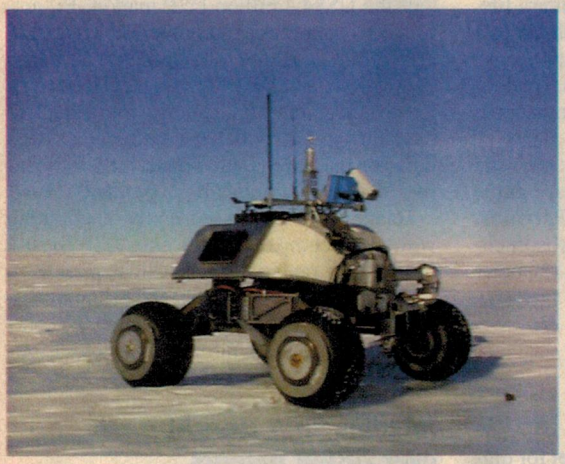
Shark Protection uses Tektronix' TDS3012 digital phosphor oscilloscope for the development and testing of the POD. According to Mike, the TDS3012 is a critical piece of testing equipment for the development of Shark Protection's next generation, multi-purpose POD known as the 'The Shark Shield', which is a compact version of the POD that has been designed to satisfy the needs of swimmers, surfers, sailboarders and divers, giving protection while the wearer is engaged in water sport.

For further information, contact: Impact Industries, 16 David Avenue, Glenelg North SA 5045 Phone: (08) 8376 0808

## Robot meteorite sniffer in the Antarctic

Reported as the first fully autonomous exploratory robot, NASA's new 'smart' four-wheeled rover spent nearly two weeks on a frozen Antarctic plain, examining over 100 indigenous rocks and ultimately classifying seven as genuine meteorites.

Developed at Carnegie Mellon University's Robotics Institute, Nomad



follows a self-determined search pattern, and uses an on-board camera to spot likely looking rocks against the snow and ice. When it encountered a possible meteorite, the robot deploys a mechanical arm equipped with a high-resolution camera, a spectrometer to gather visual images, and spectroscopic data that helps to determine the rock's composition — it's GPS system then logs the location.

Nomad is currently searching Elephant Moraine, one of the continent's richest meteorite fields, which includes meteorites from Mars that have been deposited over the millennia and preserved by the Antarctic environment. "Antarctica is the closest thing on Earth to Mars." said Dimi Apostolopolous, project manager of the Robotic Antarctic Meteorite Search initiative at Carnegie Mellon University. "It's so harsh, all your equipment is strained to the limit. Nomad's technology will be important for future generations of planetary rovers."

In Elephant Moraine, Nomad ultimately classified seven rocks as meteorites, which were later analyzed by scientists in the lab. They confirmed that five of the samples were meteorites, but the remaining two will need further study. "There is a dispute between the humans and the robot," said an amused Apostolopolous. "Nomad classified two rocks as meteorites and the humans thought they were terrestrial rocks."

## New instructions speed controller programming

SPLat Controls have announced the addition of Fast-track programming to their range of Australian designed and manufactured microPLCs. Fast-track is a set of just 12 instructions that are all a novice need learn in order to write useful machine control programs.

According to SPLat designer David Gibson, Fast-track reduces the learning time required to produce useful results with SPLat from "several hours" to "a couple of hours".

Gibson explains that the Fast-track concept came about from analysing the kinds of uses the SPLat microPLCs were being put to. "We noticed that a majority of programs were what we call simple linear sequences. By a linear sequence we mean a fixed sequence of steps where each step is triggered by an external input or by a timer. Such sequences involve no branching or exception handling". Typical machine control applications would be a roll steel feeder and punch, or a bottle capper.

The Fast-track instructions include Wait for an input, Pause, Branch on the state of and input and Wait for an input with a timeout. None of the Fast-track instructions requires any knowledge of the internal workings of the SPLat controller. The 12 Fast-track instructions are a subset of SPLat's full repertoire of 108 instructions, which include indexed I/O and memory addressing, floating point and finite state machine support.

More details of SPLat and Fast-track, including a free download of the SPLat/PC programming software with Fast-track, are available at **www.splatco.com.au**. SPLat is available through Middendorp Electrical and other leading electrical wholesalers. OEM/reseller inquiries can be directed to the national distributor AVH on 1800 633 620. ❖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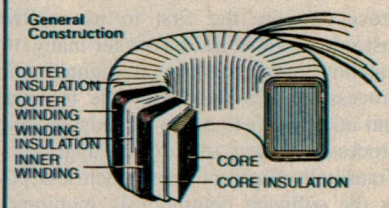
**TOROIDAL TRANSFORMERS**

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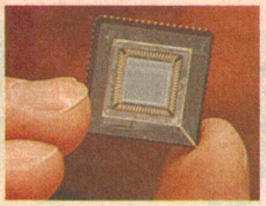


# Silicon Valley Newsletter

## Secret processor finally revealed

A SILICON VALLEY start-up that has shrouded itself in secrecy for the past five years has finally revealed its Crusoe microprocessor, which the company believes could set the microprocessor market on its ear. The chips not only match up to some of the best CPUs made by Intel and AMD, but use a fraction of the power, a key requirement in future wireless Internet appliances.

After five years of development and US$100 million in venture capital support, Transmeta said its new line of four Crusoe processors are the first to use software, instead of silicon transistors for many of the functions performed by traditional microprocessors. Besides being able to upgrade and add new features to an existing microprocessor by way of software upgrades, the Transmeta chips consume much less power as the software continuously monitors the load on the CPU and adjusts power consumption accordingly.

Another key advantage of the software approach is that software makes it possible for the processor to 'learn' about an application while it runs, and use that experience to extend battery life. The Crusoe chips will enable manufacturers to design a new generation of mobile computers, communications and Internet appliances with two or more times longer battery life. Notebook and other systems could be left on all day, instead of a few hours.

Transmeta said it would immediately ship the first two chips in the Crusoe line. The first, the 333MHz TM3120, uses the Linux operating system and sells for just US$65. It will target Internet appliances and other hand-held gadgets. A 400MHz version costs US$89. A second chip, the TM5400, will be aimed at ultralight notebook computers running Microsoft Windows and NT operating systems. The TM5400 chips come in 500MHz and 700MHz varieties and cost US$119 and US$329 respectively. All of Transmeta chips will be manufactured by IBM.

"Computing is going mobile, and microprocessors must too. Cellular phones became more pervasive when they were made smaller and provided greater battery life. We believe that Crusoe will bring about a change of similar magnitude in mobile Internet computers", said Transmeta CEO Dave Ditzel, a former microprocessor designer for Sun Microsystems and AT&T's Bell Laboratories.

Low power has long been regarded as the Holy Grail of mobile computing. But in the race to produce ever more powerful processors, companies like Intel and AMD have focused mostly on raw silicon computing power, which usually means new chips will be power-hungry. Ditzel explained that the cellular telephone market didn't take off until the phones started to offer longer battery life. His company believes the same will be true for a new generation of Internet appliances and other mobile computing devices. By doubling the battery life, the Crusoe can become a major player quickly.

Some 200 people worked on the Transmeta project, including software gurus like Linux OS creator Linus Torvalds. Investors in Transmeta include Microsoft cofounder Paul Allen and billionaire financier George Soros.

## LSI licenses its ZSP technology

IN AN AGGRESSIVE move to compete with Texas Instruments in the market for digital signal processors, Milpitas-based LSI Logic has announced a deal to let competitor Broadcom licence, produce and sell ICs based on LSI's 'ZSP' analog-to-digital converter technology.

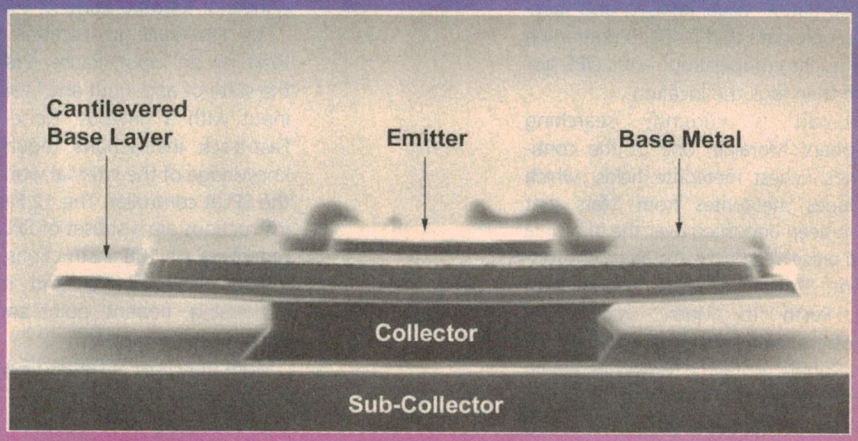
Like DSP processors, ZSP offers system makers an electronic engine for changing light, heat, sound and other analog signals into digital formats that can be manipulated or transmitted over the Internet.

LSI believes that by licensing ZSP to other chipmakers — even its competitors — ZSP will be able to compete effectively with Texas Instruments, which controls nearly half the US$4.4 billion DSP market. By getting a broader range of companies using ZSP chips from a variety of suppliers, LSI hopes its own sales will thrive as well. "There are a lot of different applications for this ZSP technology that will have tremendous volume for us", said John Daane, LSI's executive VP for communications products.

Daane said LSI is currently negotiating with other companies to license ZSP for use in products ranging from cellular phones to high-speed cable modems and set-top boxes, so consumers can eventually watch TV, surf the Internet and talk through their televisions over the Web.

## Rambus sues Hitachi over DRAM patents

CHIP DESIGN HOUSE Rambus of Mountain View has filed a Federal patent infringement lawsuit against Hitachi, accusing the Japanese company of wrongfully using its innovative PC performance-enhancing DRAM memory chips technolo-




*TRW Space & Electronics Group, of Redondo Beach, California, has demonstrated what it claims as the world's fastest digital IC produced to date: a frequency divider operating at a clock frequency of 69GHz (gigahertz). The chip is made using indium phosphide heterojunction bipolar transistors, using the etched-away collector 'cantilevered base' construction shown in this electron microscope photo. The greater the cantilevering, the higher the speed of each transistor. (Business Wire photo)*

gy. Rambus has four key DRAM patents, which vastly increase the speed at which data can be transferred between the microprocessor and the system memory.

Instead of making its own DRAM chips, Rambus has licensed its technology to most of the leading DRAM chipmakers and the company will receive royalty fees when Rambus-based DRAMs are sold. The lawsuit accuses Hitachi of illegally importing and selling chips that incorporate its patented inventions.

"Rambus has invested hundreds of engineer-years and over US$100 million" to develop its chips, protected by more than 80 patents worldwide, according to a Rambus statement. The company is asking the court to force Hitachi to stop using its technology and award damages and legal fees.

## Court rules on DVD copy sites

EARLY IN JANUARY, a Silicon Valley judge refused to block a group of Web site operators from posting software that would let consumers copy DVD movies onto computer hard drives, from which the content can easily be distributed via the Internet. But now Santa Clara Superior Court Judge William Elfving has overturned the ruling and granted a temporary injunction against posting the software online.

Elfving acted at the request of the DVD Copy Control Association, a Morgan Hill, California-based group that is the sole licensor of an encryption system to prevent unauthorized duplication of DVD content. The CCA sued a group of Web site owners in an effort to have the copying software removed.

In the earlier ruling, a lower court said that under the First Amendment of the US Constitution, which defines freedom of speech and expression, the posting of a work-around does not necessarily constitute a violation of copyright law.

The Santa Clara court ruling came one week after eight major movie studios, including Paramount Pictures and 20th Century Fox Film, won a similar preliminary injunction barring three New Yorkers from continuing to distribute software that allows bootleggers to copy DVDs.

## Applied buys Etec for US$1.8 billion

IN ONE OF THE biggest acquisitions in the semiconductor equipment industry, Applied Materials announced it has agreed to buy Etec Systems of Hayward in Silicon Valley for US$1.8 billion in stock. Analysts were surprised as the deal moves Applied into the photo mask business for the first time, an area that is somewhat removed from Applied's traditional wafer processing business.

Etec is the largest producer of photo mask-making tools, with 75% of the market for mask-writing tools, followed by Hitachi. Using lasers, Etec's products draw the circuit patterns onto glass photomask plates. The photomasks are inserted into a lithography tool. When light is beamed through the photomask, the IC patterns are transferred onto chip surfaces. Subsequent chemical processing by various Applied etching and chemical deposition tools then builds the three-demensional integrated circuits.

Applied believes that as IC patterns get smaller and smaller, having control over the mask-making process will end up giving Applied Materials an advantage in providing broad IC processing solutions.

## Intel heads DRAM consortium

THE SKYROCKETING COST of developing future generations of DRAM memory chips has prompted Intel to team up with the world's top five DRAM producers to jointly develop technology to manufacture advanced new one- and four-gigabit DRAM chips, which should enter the market in volume around 2003.

The agreement is supported by Hyundai, Samsung, Micron, Siemens and NEC. Together, the companies control more than 60% of the world's DRAM market. "Under the terms of the agreement, the developers will work together and with industry participants to develop the architecture, electrical and physical design, and related infrastructure for this advanced DRAM technology", a joint statement said.

Perhaps most significant is the participation of Intel, which headed the effort to form the joint development consortium. Intel's microprocessors drive innovation in the computer industry, but until now there has not been an effort to coordinate development of the two most vital computer components: CPU and memory.

"Intel's role will be that they provide us with the application guidelines, their application expertise and the process or requirements for the future," said Farhad Tabrizi, VP of Hyundai Electronics, now the world's largest DRAM maker in terms of production capacity. "DRAM companies have always been working together to define the next generation. But this time, Intel positively wants to be one of the partners in this effort", he added.

Chip makers will benefit tremendously from the cost efficiencies achieved by pooling the human and financial resources needed to develop next-generation DRAMs. Intel too stands to benefit from the advances in DRAM production. Traditionally, the DRAM market has been the technology driver in the chip market. Since the DRAM recession started in 1995, however, the lead shifted toward companies like Intel, as cash-starved DRAM producers were unable to invest in new technology at the pace they had maintained for much of the past 30 years. ❖

## Steve Jobs flying high as Apple stock soars

APPLE COMPUTER ONCE again beat Wall Street forecasts with a US$183 million profit, as sales of iMac and iBook computers remained strong in their first quarter, which ended Dec. 31. To reward Steve Jobs for his work these past two years, Apple presented Jobs with a US$90 million Gulfstream V airplane and $1.2 billion in stock options.

Apple's sales rose an impressive 37% to US$2.34 billion, from $1.7 billion a year ago. US$300 million worth of products were sold from Apple's Online store.

"We are delighted that Apple is delivering strong growth on every front — revenues, profits and units — and in particular that our unit growth last quarter was 2.5 times higher than the industry average, which leads directly to market share growth", said Jobs, now Apple's permanent CEO. "Apple also continues to deliver the best asset management in the industry, ending the quarter with less than one day of inventory", he said.

"Steve saved the company, when you get right down to it. His skills, his creativity, saved this company from near-death, and we felt we had to do something to get him to stay around", said Apple board member Ed Woolard, who pointed out that Apple's market value has risen from less than US$2 billion to over $16 billion under Jobs' leadership.

## IBM bets on Linux

IBM HAS FURTHER extended its support for the Linux operating system by making all of its network computers compatible with the operating system — which IBM sees as superior to Unix or Microsoft's Windows for future Internet commerce.

IBM will configure its four lines of computer servers to work with Linux. This all but lifts Linux to the level of a mainstream business solution, and diminishes any claim by Microsoft that the OS isn't suitable for serious enterprise consideration and adoption.

The new push into Linux "puts the world's leading server vendor on a side other than Sun and Microsoft, which are opposed to open standards and which favour closed, proprietary operating systems", said IBM spokesman James Sciales. "We believe that open standards are the key to the next generation of the Internet, and Linux is where we're placing our bets."

# MARKETPLACE

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## Moffat's Madhouse

*(Continued from page 31)*

that global warming is occurring - we see temperature changes, out-of-season storms, the raising of the snow level. These things are real, measurable, and largely ignored.

However radio talk-show host Art Bell, one of the triggers behind the Y2K scare, has co-authored a book called *The Coming Global Super-Storm*, describing the dangers of global warming. A large stored-food company has long been an advertiser on the Bell program, promoting protection against starvation caused by a Y2K catastrophe. Now the advertising suggests diverting unneeded stored food to another purpose - protection against violent weather caused by global warning. And the message is — why don't you add some more food while you're at it... this crisis could be much worse than Y2K. Indeed it could...

The other issue causing concern is asteroid impact. This resulted in a couple of scary films last year about protecting the earth from asteroid destruction. These movies obviously made some money for someone, but so far nobody seems to have come up with a sure-fire home asteroid repeller, so the profit motive is yet fairly weak. But the issue is causing real fear in official circles.

I host a local television talk-show, and last week's guest was an astronaut named John Fabian who flew on the space shuttles Challenger and Discovery back in the eighties. Although officially retired, John keeps close ties with NASA.

In the course of the interview I asked him if he thought asteroid impact was worth worrying about. His answer was, yes, it is causing the most concern of any issue NASA is involved in. They are spending major time and money working out what to do if an asteroid is discovered heading toward earth.

One option is to nudge its path away from a collision course using an ion-drive engine. Another possibility is to nuke the thing as they did in *Armageddon*, hopefully blowing it to smithereens. But current wisdom is that blowing it up would result in many asteroid impacts instead of one - like a shotgun blast rather than a single bullet. So there's a lot of work yet to do on that problem — but will research occur, without a profit motive? Let's hope so, if nothing else, for the sake of our kids...❖

# Forum

Frankly, though, I think cost is just a red herring. The real problem is that a significant number of manufacturers and/or their distributors simply don't wish to provide the information at all, or only to the service agents they've appointed with exclusive franchises in each area. And it's *this* that is wrong, in my view, because it effectively quashes what I see as a basic right of consumers: to be able to repair the equipment they've purchased, if they're able, or at least have the right of choice in terms of who they wish to repair it.

By the way I also can't follow your comment that it may seem 'harsh' for independent service organisations who 'want some of this action' to have to pay for the information and spare parts needed to do so. To me this doesn't seem harsh at all, because we weren't asking for free servicing, or for manufacturers to subsidise the servicing of their equipment by independent organisations. All we were asking was that the information and spare parts should be *made available*, to anyone who needs them — at whatever price is fair and reasonable to all.

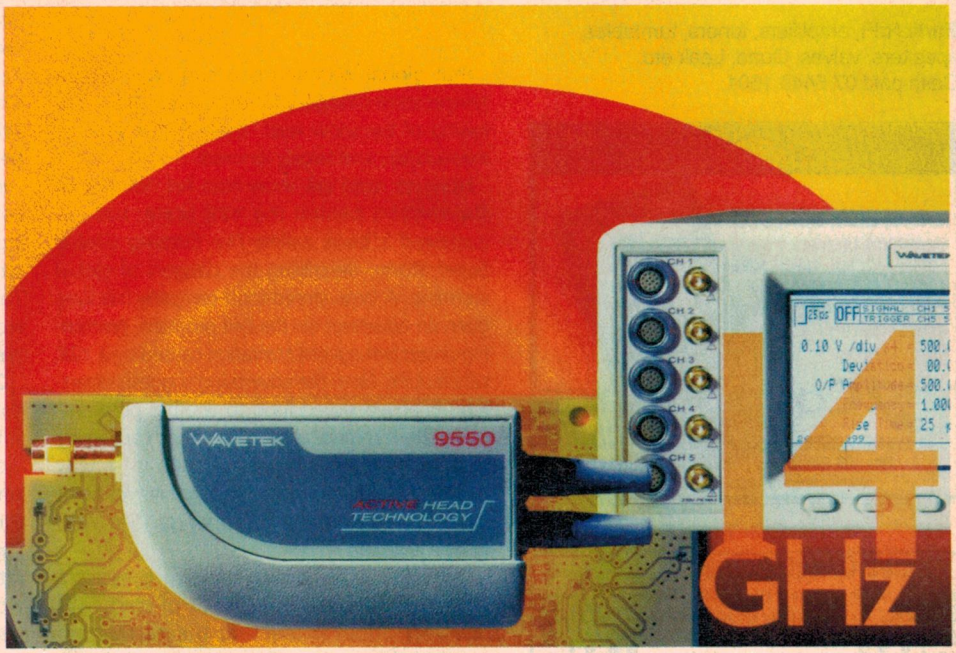
How this could have been interpreted as a call for manufacturers to 'subsidise the inclusion of independents', I'm blessed if I know.

It's interesting that quite a few people in the consumer electronics industry seem to have adopted an 'us against them' attitude towards the end consumer. How else could an attempt to speak up for a rather modest and basic right of consumers, be so readily interpreted as an attack on manufacturers, and their right to make a reasonable profit? Only if the latter somehow involves an inherent denial of the other, surely — and I really don't think that's true.

Perhaps the only way to achieve ready availability of servicing information would be to have it enforced by trading laws. Then all manufacturers or distributors offering equipment for sale would be forced to make the information available freely and at a reasonable price, as a guaranteed support service. That way no single supplier would be disadvantaged competitively, and initial equipment prices shouldn't rise significantly either. What do *you* think? ❖

# New Products

## 14GHz head for scope calibrators




Wavetek has introduced a new addition to its highly successful 9500 Oscilloscope Calibration Workstations. The new Model 9550 Active Head provides a high precision 25-picosecond pulse to allow oscilloscope manufacturers and calibration service providers to calibrate the latest oscilloscopes.

The 9550 provides a pulse with impressive rise and fall times of 25ps right at the terminals of the unit-under-test, thereby guaranteeing the integrity of the signal. The 9550 Active Head is controlled by Model 9500 Oscilloscope Calibrators.

For more information contact Wavetek Ltd, Hurricane Way, Norwich NR6 6JB, UK.

## Ultra-thin Power Wafer inductors

To meet the height restrictions of PC cards and other low profile applications, Coilcraft is introducing a new line of Power Wafer inductors. The first is the new LPO2506 surface mount power inductor series with an above-board height of just 1.19mm and a footprint of 7.87 x 9.14mm.

This low height is achieved by dropping the inductor core through a hole in the circuit board. Custom designs can further reduce the height to as low as 0.9mm, depending on board thickness. If in-board mounting is not practical, an on-board version is available with an overall height of 1.65mm.

Despite its small size, the LPO2506 Series can handle currents up to 1.9A RMS. There are 15 inductance values ranging from 4.7 to 1000uH. The parts are optimized for reliable pick and place operations, with a ceramic body and a large flat top.

To help engineers incorporate these parts into their designs, Coilcraft publishes PSPICE models which are available on the web or on a CD. Free evaluation samples and a Designer's Kit with examples of all standard values are also available.

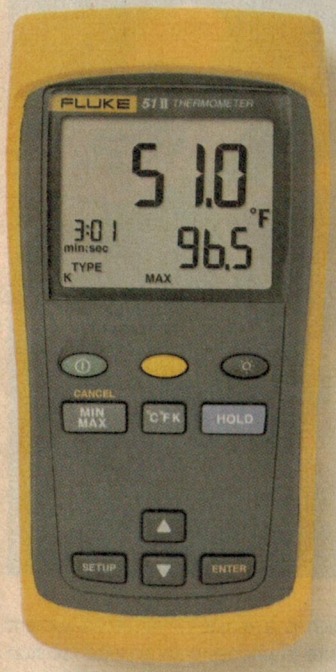
For more information contact Coilcraft, 1102 Silver Lake Road, Cary IL 60013 or visit their website at www.coilcraft.com.

## New digital thermometers from Fluke

Fluke's rugged new 50 Series II thermometers offer high accuracy with fast response times to quickly capture your measurement and show you trends. Four models provide different options in terms of functionality, thermocouple support and data logging capabilities.

All Fluke 50 Series II models offer:

- Laboratory accuracy: +/-(0.05% +0.3∞C);
- Large backlit dual display which presents all the information needed at a glance;
- MIN, MAX and AVG — with time references — to capture major events;
- Electronic Offset function maximizes overall accuracy by allowing you to compensate for thermocouple probe errors;
- Support for a wide range of thermocouple types: JKET, models 51 and




52; JKETRSN models 53 and 54;

- Temperatures displayed in ∞C, ∞F and K;
- Splash and dust resistant case with holster to increase ruggedness;
- User friendly front panel that's easy to set-up and operate;
- Sleep mode to increase battery life — typically 1000 hours; and
- Battery door allowing easy battery replacement without breaking the calibration seal.

For more information contact Obiat, 129 Queen Street (PO Box 37), Beaconsfield, NSW 2014.

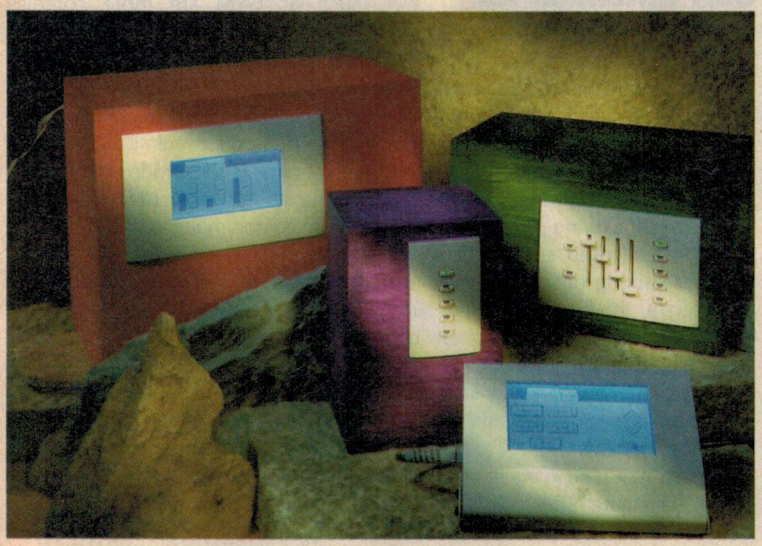
## Architectural lighting control

ETC has now released its CE approved Unison architectural lighting control systems in Australia. The simple yet powerful range provides unparalleled flexibility for small to large installations.

At the heart of the Unison system is a control rack housing the central processor with battery back-up memory for storage of all system parameters and programs, and an integral floppy disk drive. The rack also provides network connection to wall stations, PCs for online control and other Unison racks. Output is via a single DMX-512 data stream to dimmers and a DMX-512 input is also provided with powerful supporting programming options.

The control station is available in a range of finishes with button, fader, infrared and LCD touch screen stations to suit any application, Any button or fader can be configured for virtually any function including preset selection, room combine and macro selection. An integral astronomical time clock provides a variety of programming options, and interface station offer integration with AV, security and building management systems.

For more information contact distributor Jands Electronics on (02) 9582 0909.



## 24V LED panel mount indicator

Dialight Corporation has added a 24-volt DC version to its 608 series of snap-in LED front panel indicators.

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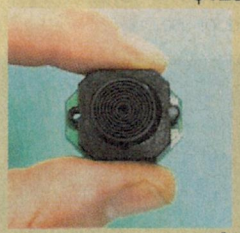
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Designed for snap-in mounting in 8mm holes, the IC-compatible indicators are available with red, green and yellow LEDs that provide uniform illumination and long, reliable operation. Peak wavelengths are 635nm for red LEDs, 565nm for green and 585nm for yellow. Intensities at 20mA are 80, 150, and 120mcd respectively. Housings are a polycarbonate material that matches the colour of the LED. The indicators are also available in 6V and 12V DC versions.

For more information contact Dialight Corporation, 1913 Atlantic Avenue, Manasquan, NJ 08736.

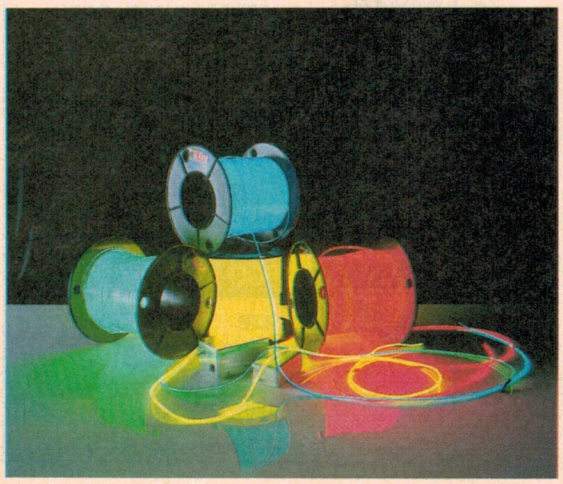
## Electroluminescent cable

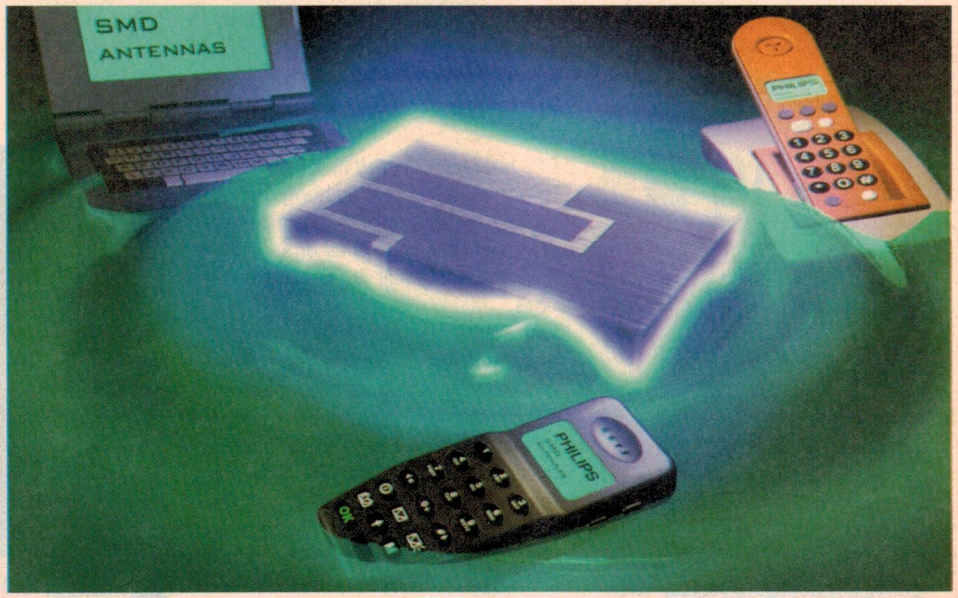
Dick Smith Electronics has released a new electroluminescent cable called Flexiglow Cable that is suitable for use in signs, displays and household applications.

The new cable, sold by the metre, is a phosphor-coated wire that glows when electrical current is applied. Unlike other cable lighting, the illumination is consistent throughout its length.

The cable is only 3.22mm in diameter, making it ideal to create special effects around any surface. The colours available are red, green, yellow and ultramarine blue.

To power the wire, an inverter and a DC adapter are required. Dick Smith Electronics has two adaptors — one for lengths of 5 to 25 metres (Cat. No. S-4596, $79), the other for 25 to 100 metres (Cat. No. S-4597, $169). The recommended 12V DC adapter has a retail price of $33.50 (Cat. No. M-9670). The inverters are for indoor use only.






To connect the cable to the invertor, a small amount of soldering and heat shrink sleeving is required. The manufacturers of the cable recommend that for a temporary bond hot glue or another removable adhesive be used and for a permanent bond super glue is recommended.

Flexiglow Cable and the inverters are available from Dick Smith Electronics PowerHouse stores located at Moore Park, Bankstown and Penrith in NSW and Carnegie and Nunuwading in Victoria for a retail price of $19.25 per metre, or via mail order by calling Dick Smith Electronics Direct Link on 1300 366 644 (or visit the website at www.dse.com.au).

## SMT antennas for mobile phones

Philips Components has announced a breakthrough in surface-mount antenna technology that promises to give mobile phone manufacturers much greater design freedom, a simplified manufacturing process and significantly enhanced equipment reliability. Measuring only a few millimetres square, the company's new surface-mount ceramic antennas can be assembled directly onto the phone's printed circuit board using standard pick-and-place equipment and re-flow soldering methods.

Internally mounted in the phone, they totally eliminate the possibility of mechanical damage to the antenna, which is a major cause of equipment failure in phones with an external stub or whip antenna. With the introduction of two different antenna product ranges, the company now has surface-mount solutions for narrow-band applications such as Bluetooth, DECT, PHS and W-LAN, and wideband applications such as GSM, DCS, AMPS and CDMA.

Narrow-band applications such as Bluetooth, W-LAN, pagers and DECT are covered by Dielectric Resonator Antennas (DRAs) — highly efficient monolithic designs in the shape of a small ceramic block. DRAs can also be used as a second diversity-antenna in many applications, improving the quality of voice or data reception.

Antennas for wideband applications such as GSM are more complex Printed Wire Antennas (PWAs) that can be designed for dual-band applications, such as 900/1800MHz GSM phones. They give manufacturers the ability to produce multi-band or multi-mode phones for a wide range of different system combinations without the need for multiple antennas. The initial GSM900/1800MHz version measures only 11 x 17mm and has a mounting height of just 2mm. The low profile of the PWA also makes the product suitable for applications such as personal digital assistants.

For more information contact Philips Advanced Ceramics & Modules, Marketing Communications, Building TQIII-3, PO Box 218, 5600 MD, Eindhoven, The Netherlands. ❖

# Win 1 of 6 Tektronix TX3 Multimeters

***including a WSTRM PC Interface software package, valued at $1,115 each** incl. tax.*

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## SPECIFICATIONS:

The Tektronix TX3 Multimeter is one of the new TX-DMM™ family of handheld true RMS digital multimeters. The new flagship DMMs simplify measurement tasks with an innovative design that provides an easy-to-use interface, one of the largest digital readouts available and Windows 95/NT compatibility. Also available (and included in the prize package) is the WSTRM PC interface package, consisting of an optically isolated PC interface cable and WaveStar™ for Windows 95 software. The WSTRM's remote capabilities convert the TX-DMM™ multimeter into a virtual instrument and data acquisition system.

### Features of the Tektronix TX3 Multimeter:

- Extra large, dual numeric display with back light
- 1000V CAT III (IEC 61010 Compliant) Input Voltage Safety Rating
- Built-in K-type Digital Thermometer
- Diode check and continuity beeper
- Set-up menu for custom user defaults
- Auto and manual hold and ranging
- MIN/MAX/AVG/MAX-MIN recording with time stamp
- Relative (Delta) Measurements
- dBm and dB
- 4-20mA Process Loop Measurement with % readout
- Rugged Versa-Stand boot
- Traceable calibration certificate included
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- CE, UL, CSA safety certificates

**The TX-DMM™ family is available through authorised Tektronix distributors**

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CONDITIONS OF ENTRY: 1. The competition is open to Australian residents authorising a new or renewed subscription to Electronics Australia magazine. Employees of IPMG, Tektronix, their subsidiaries and families are not eligible to enter. 2. Prizes are not transferable or exchangeable and may not be converted to cash. 3. The judge's decision is final and no correspondence will be entered into. 4. The competition commences on January 10, 2000 at 9am and closes last mail on March 14, 2000. 5. The draw is at the promoter's premises on March 23, 2000 at 11 am and the winner will be announced in The Australian, issue date March 27, 2000 and notified by mail. In the event of any unclaimed or unwanted prize, a second chance draw will be conducted on July 23, 2000 subject of Reg. 37 of the Lottery & Gaming Regulations 1993 (SA). 6. The prize is one of six TX3 Multimeters from Tektronix valued at $1,115 rrp each. 7. Total prize value $6,690 rrp. 8. The promoter is FPC Magazines, 180 Bourke Road, Alexandria, NSW 2015. 9. All entries become the property of FPC Magazines, and may be used for future marketing purposes. NSW permit No. 99/11021; ACT permit No. TP99/2015; VIC permit No. 99/3689 issued on 30/11/99; SA permit No. T99/4084; NT permit No. NT99/3395.

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# Computer News

## 'All in One' digital colour printer

Mitsubishi Electric has launched the CP770DW 'all in one' digital colour printer, which delivers clear, vivid photographic prints in seconds. It's claimed as the first digital printer of its kind to combine colour and thermal printing in the one unit, delivering new levels of versatility for printing in applications spanning the medical, scientific and security industries. Whether sophisticated colour copies or low cost black and white images are needed, the printer produces cost-effective thermal prints or sophisticated detailed prints using dye sublimation technology.

Ensuring that high quality graphics and detailed images appear their best, the printer uses a high resolution head of 325ppi (pixels per inch). The print quality, comparable to sublimation printers, can be even further enhanced with a selection of fine and superfine modes. As well there has been a dramatic reduction in total printing time, with all facets of the printing process shortened including driver management and data transmission and PC processing time.

With the development of a new and much faster printer driver, there's no need to stand around waiting impatiently for prints. Pictures are produced in only 19 seconds (using standard wide size 104.8 x 75mm images). The unit's highly reliable paper feeding mechanism significantly also reduces paper handling and maintenance.

Other features include an optional SCSI interface and a large capacity roll paper system which enables non-stop printing of up to 200 prints (1 roll, standard size prints).

For further information contact Mitsubishi sales on (02) 9684 7777.

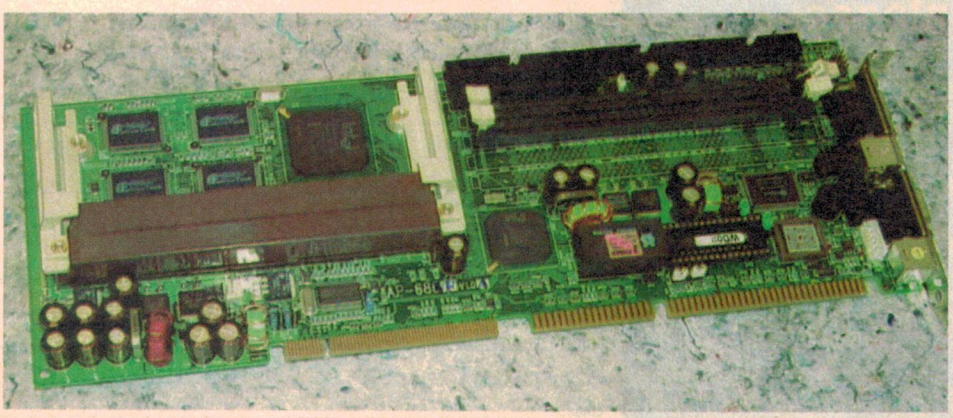
## Powerful new Pentium III SBC

Intelligent Systems Australia has released the AP-686VF, a full function single board computer with Intel 440BX chipset and AGP 4MB VGA output.

Features of the AP-686VF include the ability to support Pentium II or Pentium III processors at speeds of up to 600MHz. System memory is by two 168-pin sockets for PC100 modules up to 512MB in total. The AGP 4MB graphics chip (SIS 6326) provides high-speed graphics for demanding applications.

The card provides two COM ports, two USB ports and a printer port. Two on-board Ultra IDE/33 ports and one floppy disk port are standard. One of the more exciting features is the Disk-On-Chip technology, which is expandable to 144MB. The AP-686VF is Year 2000 tested and is an extremely cost effective card ideal for applications such as servers, workstations, industrial control, PC-numeric controllers, panel PCs, kiosks, etc.

More information can be obtained about the AP-686VF from the intelligent Systems Australia catalog on disk, from their web site (**www.intelsys.com.au**) or from Intelligent Systems Australia, PO Box 118, Berwick Vic. 3806.



## Audio DSP card for PC recording

Soundtrack Systems has raised the benchmark in standards for computer based hard disk recording products with the release of the Audio DSP 24 System III. Features include full multi-channel 24-bit 96kHz recording via professional XLR balanced connections, and outstanding 120dB dynamic range — outstripping the competition by along way.

The unit's professional XLR balanced connections are housed in external racks, along with eight high quality microphone preamps offering phantom power and gain control, 10 inputs and 10 outputs, digital I/O (S/PDIF, optical and AES/EBU), ADAT and T/DIF support. The rack unit can provide multi card support for up to 40-channel I/O (inputs & outputs). Software drivers support Win95/98, Win NT 4.0, ASIO.

The Soundtrack Audio DSP 24 package consists of a 24-bit/96kHz PCI Audio card and Digital I/O bracket. The Digital I/O bracket supports Optical, Coaxial, AES/EBU IN/OUT and CD digital IN. The package is the basis for an extremely powerful computer recording solution and can be used as the foundation for multiple studio design configurations. Up to 10 channels of pristine non-compressed real-time 24-bit/96kHz digital audio can be delivered via either digital or analog I/O on a single card.

For more information contact Sound & Music Promotions, 975 Glenhuntly Rd. Caulfield South 3162.

## LanMaster Link Tester

The new LanMaster 20 Link Tester from Psiber Data Systems provides LAN installers and maintainers with a

tool to quickly test Fast Ethernet (100baseTX) and Standard Ethernet (10baseT) links.

Fast Ethernet LAN products have a wide range of new features and capabilities. Auto-sensing, Auto-negotiation and Full Duplex capabilities are optional requirements to the Fast Ethernet (IEEE 802.3u) standard. Knowing equipment capabilities is essential to optimizing network system performance. In just three seconds, the LanMaster 20 decodes the link signals and displays the exact configuration of the equipment connected to the link.

The Model 20 also verifies link connectivity to the far end, tests for reported faults and determines polarity of the outlet or cable. It identifies the configuration of the connected hardware without opening the computer to identify the model of the Nework Interface Card or finding manuals for the Hub or Switch. Wallplates with multiple outlets are rapidly tested for 'live' links and far-end Fast Ethernet compatibility.

The Model 20 also makes network maintenance easier by instantly displaying fault conditions reported by the far-end equipment.

For more information contact JamSam, Suite 703, 225 Clarence Street, Sydney 2000.

## 6.3" TFT LCD has XGA resolution

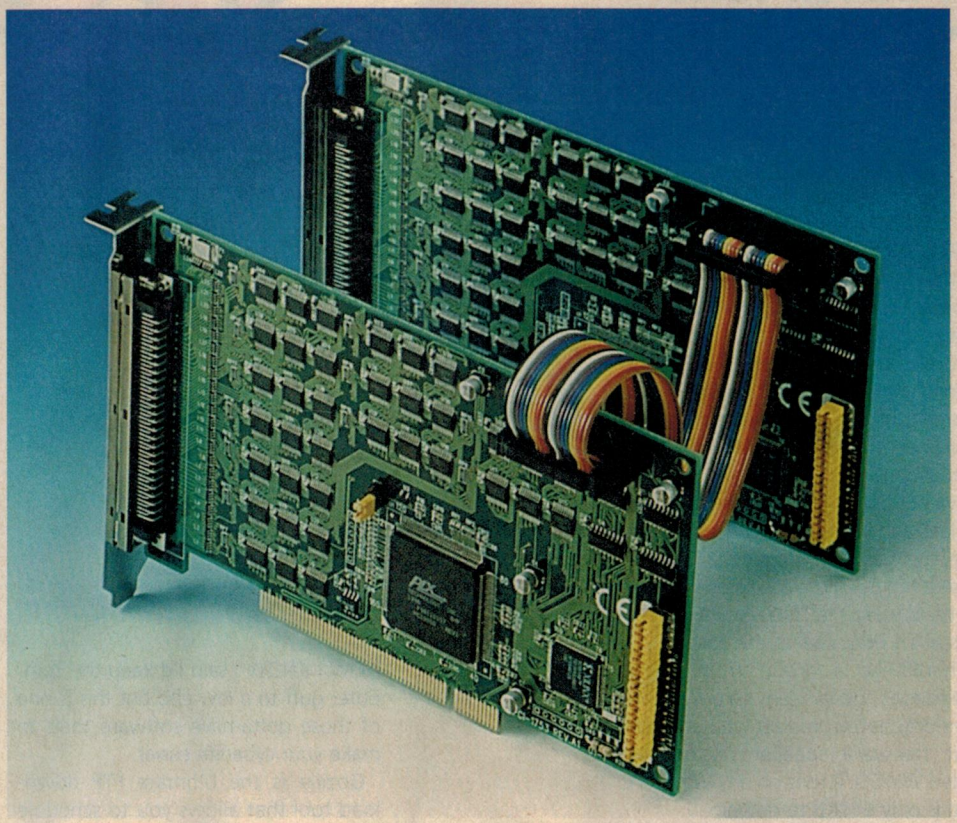
Toshiba Corporation has claimed continuing leadership in low-temperature polysilicon TFT LCDs with its announcement of the world's first 6.3-inch display with XGA resolution. The new LCD's 1024 x 768 pixel image is supported by a 0.126mm dot pitch, which achieves a density of 202 pixels per inch (ppi).

With this breakthrough, the company brings a resolution matching that of high calibre printed colour materials such as found in magazines, to a compact LCD panel the size of a typical photograph and smaller than a trade paperback.

Low-temperature polysilicon TFT LCDs offer the most promising solution for mobile personal equipment of any commercialized display. Their use of crystallized silicon allows transistors to pass electrons with much greater mobility than in amorphous silicon TFT panels, producing a higher resolution and brighter display.

They are also significantly smaller, as the display drive circuits can be formed directly on the display's glass substrate, reducing pin connections by 95%.

LTM06C310 will be commercialised in April 2000 at a sample price of 100,000 yen.



## 96/192-bit I/O cards

The Priority Electronics PCI-1753 is a 96-bit digital I/O card for the PCI bus, which can be extended to 192 digital I/O channels by connecting it with its extension board, the PCI-1753E. The card emulates mode 0 of the 8255 PPI chip, but the buffered circuits offer a higher driving capability than the 8255.

For more information contact Priority Electronics, 189 Bay Road Sandringham, Vic 3191. ❖

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# Webwatch

## By Darren Yates

Due to popular request, we've collated a list of all the sites ever covered in Webwatch, and it is available for download from our web site in the Internet files section. You can save the file on your own system, and use it as a handy reference, and download the update every month. And if you know of any sites that you feel deserve a mention in Webwatch, drop us a line at info@electronicsaustralia.com.au, and we'll be happy to include them in an upcoming column.

**REGULAR WEBWATCHER** Graham Cattley has worn out the wheel in his mouse and has asked me to take over the good ship Webwatch.

Putting on the captain's badge, I've sworn on a stack of databooks to search out the best electronics sites and keep the computer-related guff to a minimum...

I've been interested in speaker design of late and while it's possible to calculate the box size, frequency response and group delay of your favourite driver by hand using the Thiele-Small parameters, it's a right pain in the neck.

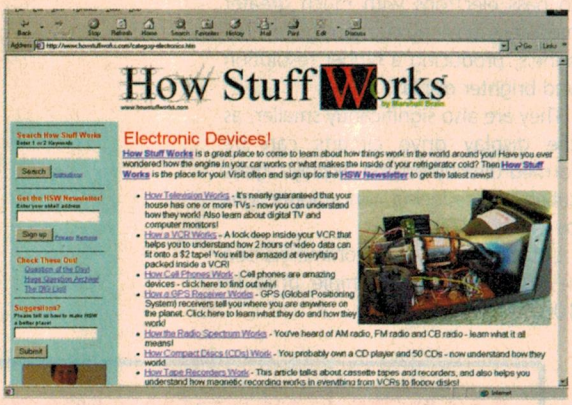
Thankfully, a group from calling themselves LinearTeam [www.linearteam.org] have come up with an excellent freeware speaker design tool called WinISD. It runs on any Win9X PC and is only 640KB to download.

I think the software is a ripper — it's graphical, easy to use and also includes a database so you can store away the TS parameters of a range of speakers. Better still, why not use the database that comes with it? The only downside is that not all of the TS parameters are included but you can add in the full set for your own database.

Considering the price, you can't argue with it and compared with the other shareware and freeware tools, this is far and away the best. It also works with litres instead of cubic feet — on that score alone, I'd rate it a download. Point your browser to **www.linearteam.org/winisd.html**.

NOW I KNOW I said I'd keep the computer guff to a low ebb but this is one of those gotta-have software tools to make your cyberlife easier.

Gozilla is the ultimate FTP download tool that allows you to schedule files, resume file downloads that have stopped because your modem cut out, without your having to start from scratch. One of the best options is the leach tool that lets you download an entire web site with the click of a button.




It's free but you have to cop a bit of web advertising. Still, it's the right price and works like a dream. Again, send your browser to **www.gozilla.com**.

I'VE ALWAYS HAD a fascination for wanting to know how things work, starting when I was three, pulling out my father's pristine LPs and proceeding run over them with a sharp pencil, waiting to hear the dulcet tones of Frank Sinatra.

If that's you, then you'll love How Stuff Works. My predecessor already picked this one out about a year ago but it now includes 'How television works' and on that basis, thought it should get another run. Head to **www.howstuffworks.com/tv.htm**.

I HAVE TO ADMIT to being a bit of a technology history buff as well and love reading about how technology such as radar, television and radio started. A Thumbnail History of Electronics isn't going to shatter you with startling new claims, but its a quick *Who's Who* guide to electronics, how it started and who's to blame. It's maintained by the University of Maryland and is well worth a read. Take aim at **www.ee.umd.edu/~taylor/Electrons.htm**.

IF YOU HATE web sites that seem to take years to load and then offer little, take a look at Chip Directory. It's one of a growing number of IC search facilities on the web, allowing you to look up a chip by its name, manufacturer, function, even the number of pins it has. The site also has info on chips from the former USSR. It's not complete, as I discovered when it knew nothing about the LM3876 50W audio amp chip but it has plenty of devices, mainly from Philips.

If you've bought a junk-lot of ICs and have no idea what they are, you might find it at **www.hitex.com/chipdir/chipdir.html**. ❖

## DILBERT

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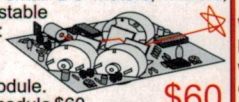


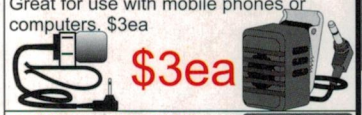
$60

Kit + laser module + plug-pack + instument style case all at a special price of $75

**BRAND NEW MICROPHONES!!! DESKTOP MICROPHONE** Ideal for use with computers etc. Has uni-directional electret mic. insert & terminated with a stereo 3.5mm plug. for just $5

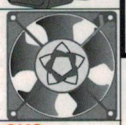
$5

**TWO TIECLIP TYPES** Great for use with mobile phones or computers. $3ea



$3ea

**NEW 80mm 12V FANS** Ideal replacement for computer power supply fans. 12V @ 0.15A...$4 or 4 for $12



**LITHiUM-ION BATTERY PACKS AUDIOVOX BTR600R 400mAh 7.2V** This battery pack contain two re-chargeable Lithium-Ion cells, with an amazing 400 mAh capacity in such a small cell (51mm X14mm). Ideal for use as R/C receiver batteries etc. $4ea

**Also BTR400R 800mAh 4.8V** ...$3

**KEY-CHAIN LASER POINTER** in a presentation box. Quality metal housing + 3X LR44 /AG13 bats. **FREE.** Extra bats. 50c Ea.

$10

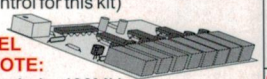
**Line lens+$0.80...X-hair lens ( + ) $0.80...Module (no case) only $8**

**PC MOTHER BOARD SPECIAL** 40MHz - 486 new in original packaging with booklet 3 for $30 or $15 ea.

*****NEW KITS*****

**Three new remote control kits**

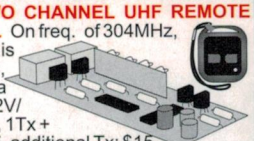
**8 CHANNEL IR REMOTE:** (pictured) Features include: professionally built transmitter slim case, 8 changeover relay outputs (6 momentary or latching, 2 latching). $50....(coming soon digital volume control for this kit)



**4 CHANNEL UHF REMOTE:** Features include: 433MHz X-tal / saw resonator locked, security coding, small key fob type transmitter (pictured), 4 configurable (momentary or latching) changeover relay outputs. $60

**2 CHANNEL UHF REMOTE:** same as above but just 2 channels. $45

**ONE / TWO CHANNEL UHF REMOTE CONTROL** On freq. of 304MHz, transmitter is assembled, receiver is a kit, inc. 2 12V/ 12A relays, 1Tx + 1Rx kit:$45, additional Tx: $15



**1 CHANNEL Kit just** $25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## ***DIGITAL ECHO KIT***

Why play around with outdated Spring Reverbs when soon we will have a low cost kit based on a LSI IC. This is not a bucket brigade type of IC! It is proper digital system with sampling, A-D conversion, memory, D-A conversion etc. The kit can be configured to function as an "Echo", "Reverb" or a "Surround" sound delay. The complete kit price will be approx. $25! COMING SOON - WATCH THIS SPACE

## CATALOGUE.... Ask for one with your next order.

**iF YOU DON'T CHECK OUT OUR BARGAIN CORNER REGULARLY YOU COULD BE MISSING OUT ON SOME GREAT BARGAINS**

**AMAZING BARGAIN!!!... STEREO FM RADIO ON YOUR COMPUTER FOR JUST $15**

$15

Includes antenna

See Web Site for more

$18

Includes Plug Pack

Oatley's buyers have done it again!...Witha scoop purchase of FM receiver cards & column speakers. Easy to install, quality stereo sound, change stations with a click.The speakers have built in amp headphone socket & volume control. **FM receiver + speakers $30**

***** BRAND NEW *** *** SUPER SPECIAL*** 5IN 1 REMOTE CONTROL** This remote is designed to work with 100's of different TVs, VCRs etc.(max. 5 at a time)all you have to do is select the right one from the chart supplied. 3 for $60 look for video switcher / remote special in this ad

$25

**RADIO CONTROL MODEL SERVOS** These servos are ideal for robotics projects with good speed and high torque specs. They are supplied with a selection of output arms and disks plus mounting screws. If you ask us we will send a free simple circuit diagram to drive servos. **$18**

**COUNTERFEIT STAMP MICRO.** Stamps are simple but powerful R.I.S.K. (reduced instruction set controller) micro processor that can be programed with it's own style of BASIC. It has 8 pins that can be configured for analogue or digital IO's, This is a copy of the popular Stamps with lots of application software available on the Internet. Just $60 with a free plug-pack If required software, book and cable kit is available for $90

**QUALITY AUSTRALIAN MADE FEATURE PACKED MINI ALARM SYSTEM.** Features inc. boot release, central locking output, imobiliser output, indicator flash relay. Has with 2 key-fob transmitter keys. Drawn in proportion

$99

**CAMCORDER AND ACCESSORIES NiCad. BATTERIES 6V 2400mAh. Multi-fit type.** These are new and in original pack. Two types. One type (sbc5223) fits CANON, BAUER and equivalent. The other (sbc5225) fits HITACHI, SABA, MINOLTA, RCA and equivalents. Just a fraction of the retail price at $22

**NEW AUSTRALIAN PLUG PACKS AT BELOW WHOLESALE PRICES**

**GENERAL ELECTRIC** 20VA 14VDC @ 700mA..

**AUDIOVOX** 9Vdc @ 500mA

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**204 X 104 X 41mm**

**Composite video in**

**Res. 450 TV lines**

**Weight 650g**

**Intro price of $145**

$145

**NICAD 7.2VCHARGER / DISCHARGER** Professional, built & tested fast NICAD charger and discharger PCB assembly. in a desktop case Switch mode circuit, Has 6 ICs, 3 indicator LED's, 3 power MOSFETS, a toroidal inductor etc. Nominal unregulated input 13.7V DC, 900mA charge current. Appears to use voltage slope detection for charge terminating, also a timer (4060) to end the charge. We supply a thermistor for temperature sensing + a cigarette lighter lead to use in a car **$7ea or 3 for 18.**

***** KIT SUPER SPECIAL *****

**4 CHANNEL AUDIO/VIDEO SWITCHER** This is the most comprehensive video switcher kit we have seen. Features inc 4 channels switched sequentially with it's own adjustable timer or by external inputs like alarms, door switches and movement detectors, on board audio pre-amps (just requires microphones), out puts to control STOP/RECORD on your VCR, Optional modulator to use TV antenna input. This kit could be used to put a security channel on your TV to see who's at the door or in the yard or to monitor the kids playing outside. Unreal price of $45

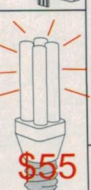
5 in 1 remote $15 when bought with this kit. See 5 in 1 remote elsewhere in this ad.

**MICROWAVE DOPPLER TRANSCEIVER (movement detector)** 5VDC operation @ 50mA. Operates at 10.525 GHz. can be pulse mode operated. Uses include alarms, radar experimentation, auto-matic doors, obstruction de-tection for vehicles and robots etc. and lighting control as you enter or leave a room. Super special introductory price of $23or 2 for $40

$23

**CFL INVERTER KIT** our very popular inverter. The improved design uses a larger transformer and a SG3525 switch Mode Chip.This very Efficient Driver kit can drive a number of CFL's from 12vdc. & would be great for lighting the weekender or caravan..

**SPECIAL** 1 inverter & 3 CFLs: $45



$55

**PELTIER EFFECT DEVICES.** Could be used for cooling overclocked PC CPUs. All 40 X 40mm.

4A △ T 65deg. Qmax 42W $25

6A △ T 65deg. Qmax 60W $27.50

8A △ T 65deg. Qmax 75W $30

Comes with info to build cooler / heater plus data. Some used heatsinks avail.

**TWO MOTOR LASER LIGHTSHOW KIT** Inc. motors, mirrors, reversing switch & all electronic components. Can be controlled by variable DC input. Lots of patterns, flowers, stars etc. $16 **Laser module $8**

**IR LASER DIODE SECIAL 5mW 780nM (barley visible) Sharp LTO26** Req. 65mA.Diode plus focus lens (no housing) $18....constant current driver kit $10

**CCD NIGHT VISION!!!** Why buy a "low end (relative junk) Russian night viewer with which you can generally see about the same as with your own eyes? Cant afford a 2nd / 3rd generation viewer for 1000's of dollars? Both of these are fragile and have limited life! our viewers use a sensitive CCD camera, a high power IR illuminator and a 4" monitor. the unit is hand held but requires a rechargeable gel battery in a shoulder bag / bum bag to operate. You don't need moonlight or even starlight, it will work in total darkness with a range of up to 30meters!! what's more it is not fragile. The unit can even be used in full sunlight!! increadable low introductory prices! Click on CCD NIGHT VISION at... oatleyelectronics.com

**NEW ULTRA-SONIC RADAR KIT** This U/S radar can sound a buzzer or flash a light on your dash to let you know when your car is near another car or object. Inc. adj. upto1M. Can drive a relay or buzzer. kit inc. PCB + all on-board parts including Ultra-sonic transducers and buzzer for $16

**UHF AUDIO / VIDEO TRANSMITTER KIT** Kit includes all components needed..... PCB plus all on-board components, connectors, switch, metal case, telescopic antenna, twin RCA A/V lead, all that is needed to complete the full kit. 12Vdc @10mA operation. Ideal for transmitting audio and video around you home.. Complete Kit for just $28

suitable plugcack $5

## VIDEO CAMERAS

**HOUSED CAMERAS**

**CCD COLOUR IN SWIVEL CASE $190**

**CCD B/W IN SWIVEL CASE $99**

**PCB CAMERAS**

**B/W CCD CAMERAS $89**

pinhole (60deg.),

92 deg,120 deg.

add $10 for 150 deg.

**CMOS SUGAR CUBE CAMERAS $70**

**PLUG PACKS TO SUIT $4**

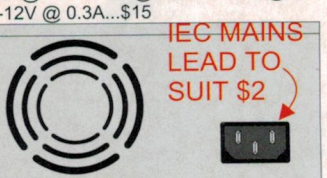
**ASK FOR A FREE VHF MODULATOR**

$160

$70

**BRAND NEW! COMPUTER POWER SUPPLIES...150W LITEON BRAND** inc. remote mains switch. +5V @ 18A ...-5V @ .03A ...+12V @4.6A ...-12 @ 0.3A...$12.50

**DVE BRAND** inc. onboard mains switch. +5V @ 15A ...-5V @ 0.3V ...+12V @ 6A ...-12V @ 0.3A...$15




**16 X 2 line LCD display $12ea/3 for $30:** Soft ware to drive display from a PC from Silicon Chips web site

TerraTec

# M3Po

## High Quality Audio Decoder

**Innovation!**

- PLAYBACK OF MP3 FILES DIRECTLY FROM CD
- WORLD'S FIRST MP3 CD PLAYER WITH HARD DISK CONNECTOR
- PLAYBACK OF AUDIO CDS
- SUPPORT OF PC COMPATIBLE PLAYLISTS (M3U)
- SUPPORTS ISO 9660/JOLIET AND FAT 16/32 FILE SYSTEMS
- USER-FRIENDLY INFRARED REMOTE CONTROL

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